Course Outline

School:	Eng. Tech. & Applied Science
Department:	Information and Communication Engineering Technology (ICET)
Course Title:	Software Systems Design
Course Code:	COMP 246
Course Hours/Credits:	56
Prerequisites:	COMP 123, COMP 225
Co-requisites:	N/A
Eligible for Prior Learning, Assessment and Recognition:	Yes
Originated by:	Mohamed Khan
Creation Date:	Fall 2012
Revised by:	Mohamed Khan
Revision Date:	Summer 2024
Current Semester:	Summer 2025
Approved by:	

Clarence Cheung, Associate Dean/Dean,
Eng. Tech. & Applied Science

Students are expected to review and understand all areas of the course outline.

Retain this course outline for future transfer credit applications. A fee may be charged for additional copies.

This course outline is available in alternative formats upon request.

Acknowledgement of Traditional Lands

Centennial is proud to be a part of a rich history of education in this province and in this city. We acknowledge that we are on the treaty lands and territory of the Mississaugas of the Credit First Nation and pay tribute to their legacy and the legacy of all First Peoples of Canada, as we strengthen ties with the communities we serve and build the future through learning and through our graduates. Today the traditional meeting place of Toronto is still home to many Indigenous People from across Turtle Island and we are grateful to have the opportunity to work in the communities that have grown in the treaty lands of the Mississaugas. We acknowledge that we are all treaty people and accept our responsibility to honor all our relations.

Course Description

This project-based course emphasizes Software Engineering design derived from a set of Requirements Specifications. Students are introduced to Component Level software engineering design principles, concepts and tasks. Design principles are applied to software architecture, software interfaces, software components, database and user interfaces. These are discussed in the context of WebAPPS and Mobile apps. Re-usability, software design patterns, architectural frameworks and Generative Ai and LLMs are discussed and are applied where appropriate in the project work. The SDLC is aligned with the iterative Agile-based methodology with UML standards. The main deliverable of the course is a complete 3-part team-based software design specification document which constitutes the term project. In addition to document submissions, each team will orally present a summary of their project at the end of the course.

External Standard Information (ESI)

N/A

Program Outcomes

Successful completion of this and other courses in the program culminates in the achievement of the Vocational Learning Outcomes (program outcomes) set by the Ministry of Colleges and Universities in the Program Standard. The VLOs express the learning a student must reliably demonstrate before graduation. To ensure a meaningful learning experience and to better understand how this course and program prepare graduates for success, students are encouraged to review the Program Standard by visiting http://www.tcu.gov.on.ca/pepg/audiences/colleges/progstan/. For apprenticeship-based programs, visit https://www.skilledtradesontario.ca/about-trades/trades-information/.

Course Learning Outcomes

The student will reliably demonstrate the ability to:

1. Explain and discuss the software engineering design principles and architecture within the context of requirements specifications.
2. Discuss and apply the concepts of re-usability and software design patterns to software development
3. Apply design principles to the UML class, Sequence and State diagrams and the database as key architecture artifacts for a software application
4. Discuss and design interfaces with external systems or devices as required by the software application.

5. Apply user GUI design guidelines for improved User's experience (UX) following closely the users' stories.
6. Discuss and design the high level component and deployment diagrams for an application.
7. Discuss and Apply various design architectural frameworks, including MVC, MVVM, and data repository, along with best practices in web and mobile app development.
8. Apply architectural design patterns for integrating generative AI services, such as OpenAI's API, Gemini API, or other LLMs, into web and mobile applications, following best practices.
9. Package and present coherently all required documentation
10. Perform effectively as a team member within a defined project plan

Essential Employability Skills (EES)

The student will reliably demonstrate the ability to*:

1. Communicate clearly, concisely and correctly in the written, spoken, and visual form that fulfills the purpose and meets the needs of the audience.
2. Respond to written, spoken, or visual messages in a manner that ensures effective communication.
4. Apply a systematic approach to solve problems.
5. Use a variety of thinking skills to anticipate and solve problems.
7. Analyze, evaluate, and apply relevant information from a variety of sources.
8. Show respect for diverse opinions, values belief systems, and contributions of others.
9. Interact with others in groups or teams in ways that contribute to effective working relationships and the achievement of goals.
10. Manage the use of time and other resources to complete projects.
11. Take responsibility for one's own actions, decisions, and consequences.

**There are 11 Essential Employability Skills outcomes as per the Ministry Program Standard. Of these 11 outcomes, the following will be assessed in this course.*

New Essential Skills (NES)

N/A

Global Citizenship and Equity (GC&E) Outcomes

The student will reliably demonstrate the ability to*:

1. Identify one's roles and responsibilities as a global citizen in personal and professional life.
4. Analyze the use of the world's resources to achieve sustainability and equitable distribution at the personal, professional, and global level.

**There are 6 institutional Global Citizenship & Equity outcomes. Of these 6 outcomes, the following will be assessed in this course.*

Methods of Instruction

This course may be delivered in on-line, in-class or hybrid mode. The method of instruction includes lectures and supervised lab exercises.

Text and Other Instructional/Learning Materials

The costs of textbooks or other learning material are available through the Centennial College Bookstore https://www.bkstr.com/centennialprogressstore/shop/textbooks-and-course-materials.

Text Book(s):
Software engineering: a Practitioner's Approach, Roger S. Pressman, Ph.D.,Bruce R. Maxim, Ph.D. 9th Edition 2020
Print ISBN: 9781260880687

Internet REFERENCES concepts and illustrations for

a)SOFTWARE DESIGN PATTERNS

b) Architectural frameworks

c) Generative AI and AI Services
Online Resource(s):

Illustrative material from a CaseTool such as Visual Paradigm.
free download Community version With Tutorials
Material(s) Required for Completing this Course:
Casetool site: www.visual-paradigm.com

New material from extensive use of Internet Web sources especially on Generative Ai and LLMs

Please see the weekly topical outline for any Additional Learning Resources required for your section of this course.

Classroom and Equipment Requirements

classrooms and labs

Evaluation Scheme

- Term Project: 3-Part Project-- total 40%
  Part A -14%
  Part B -14%
  Part C -12%
- In Lab: Project feedback: Lab Participation -
  1% each for a Total of 10%
- Test # 1: Mid-Term Test - 20%
  Chs 8-11
- Final Test: Final Test # 2 - 20%
  Chs 11-14
- Quizzes Chs 8-14: Quizzes

Evaluation Name	CLO(s)	EES Outcome(s)	NES Outcome(s)	GCE Outcome(s)	Weight/ 100
Term Project	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	1, 2, 4, 5, 7, 8, 9, 10, 11		1, 4	40
In Lab: Project feedback	1, 2, 3, 4, 5, 6, 7, 8, 9	1, 2, 4, 5, 7, 8, 9, 10, 11			10
Test # 1	1, 2, 3, 4, 5	1, 2, 4, 5, 7, 8			20
Final Test	1, 2, 3, 4, 5, 6, 7, 8, 9	1, 2, 4, 5, 7, 8			20
Quizzes Chs 8-14	1, 2, 3, 4, 5, 6, 7, 8, 9				10
Total					100%

If students are unable to write a test they should immediately contact their professor or program Associate Dean for advice. In exceptional and well documented circumstances (e.g. unforeseen family problems, serious illness, or death of a close family member), students may be able to write a make-up test.

All submitted work may be reviewed for authenticity and originality utilizing College approved plagiarism prevention software. Students who do not wish to have their work submitted to College approved plagiarism prevention software must, by the end of the second week of class, communicate this in writing to the instructor and make mutually agreeable alternate arrangements.

When writing tests, students must be able to produce official Centennial College photo identification or they may be refused the right to take the test or test results will be void.

Tests or assignments conducted remotely may require the use of online proctoring technology where the student’s identification is verified and their activity is monitored and/or recorded, both audibly and visually through remote access to the student's computer and web camera. Students must communicate in writing to the instructor as soon as possible and prior to the test or assignment due date if they require an alternate assessment format to explore mutually agreeable alternatives.

Student Accommodation

The Centre for Accessible Learning and Counselling Services (CALCS) (http://centennialcollege.ca/calcs) provides programs and services which empower students in meeting their wellness goals, accommodation and disability-related needs. Our team of professional psychotherapists, social workers, educators, and staff offer brief, solution-focused psychotherapy, accommodation planning, health and wellness education, group counselling, psycho-educational workshops, adaptive technology, and peer support. Walk in for your first intake session at one of our service locations (Ashtonbee Room L1-04, Morningside Room 190, Progress Room C1-03, The Story Arts Centre Room 285, Downsview Room 105) or contact us at calcs@centennialcollege.ca, 416-289-5000 ext. 3850 to learn more about accessing CALCS services.

Use of Dictionaries

- Dictionaries may be used in tests and examinations, or in portions of tests and examinations, as long

as they are non-electronic (not capable of storing information) and hard copy (reviewed by the invigilator to ensure notes are not incorporated that would affect test or examination integrity).

Program or School Policies

N/A

Course Policies

N/A

College Policies

Students should familiarize themselves with all College Policies that cover academic matters and student conduct.

All students and employees have the right to study and work in an environment that is free from discrimination and harassment and promotes respect and equity. Centennial policies ensure all incidents of harassment, discrimination, bullying and violence will be addressed and responded to accordingly.

Academic Honesty

Academic honesty is integral to the learning process and a necessary ingredient of academic integrity. Forms of academic dishonesty include cheating, plagiarism, and impersonation, among others. Breaches of academic honesty may result in a failing grade on the assignment or course, suspension, or expulsion from the college. Students are bound to the College's AC100-11 Academic Honesty and Plagiarism policy.

To learn more, please visit the Libraries information page about Academic Integrity https://libraryguides.centennialcollege.ca/academicintegrity and review Centennial College's Academic Honesty Module: https://myappform.centennialcollege.ca/ecentennial/articulate/Centennial_College_Academic_Integrity_Module_%202/story.html

Use of Lecture/Course Materials

Materials used in Centennial College courses are subject to Intellectual Property and Copyright protection, and as such cannot be used and posted for public dissemination without prior permission from the original creator or copyright holder (e.g., student/professor/the College/or third-party source). This includes class/lecture recordings, course materials, and third-party copyright-protected materials (such as images, book chapters and articles). Copyright protections are automatic once an original work is created, and applies whether or not a copyright statement appears on the material. Students and employees are bound by College policies, including AC100-22 Intellectual Property, and SL100-02 Student Code of Conduct, and any student or employee found to be using or posting course materials or recordings for public dissemination without permission and/or inappropriately is in breach of these policies and may be sanctioned.

For more information on these and other policies, please visit www.centennialcollege.ca/about-centennial/college-overview/college-policies.

Students enrolled in a joint or collaborative program are subject to the partner institution's academic policies.

PLAR Process

This course is eligible for Prior Learning Assessment and Recognition (PLAR). PLAR is a process by which course credit may be granted for past learning acquired through work or other life experiences. The PLAR process involves completing an assessment (portfolio, test, assignment, etc.) that reliably demonstrates achievement of the course learning outcomes. Contact the academic school to obtain information on the PLAR process and the required assessment.

Semester:	Summer 2025	Professor(s) Name:	All
Section Code:	All	Contact Information:	TBA
Meeting Time & Location:	See Schedule	Additional Information:	See Centennial Luminate

Topical Outline (subject to change):

ORIGINAL TOPICAL

Week	Topics	Readings/Materials	Weekly Learning Outcome(s)	Instructional Strategies	Evaluation Name and Weight	Evaluation Date
1	- The Agile Process/Methodology & UML standards - Software Systems Requirements Modelling	1) Required Text Chapter 8 2)Visual Paradigm Tutorials- UML (www.visual-paradigm.com)	1) Explain the Agile Process and UML standards 2)Describe the elements of a Software Requirements Specifications (SRS) document. 3)Provide an overview of the Term Group project Parts A, B & C 4) Apply concepts to Project Assignment	Lecture slides from text - re-enforced by example cases. lab: Introduce and discuss Term Project Part A - SRS Requirements and and Parts B & C SDD overview requirements. Introduce Visual Paradigm www.visual-paradigm.com	N/A	N/A
2	Software Design Concepts and principles	1) Required Text Chapter 9 2)Visual Paradigm Tutorials - Software Design (www.visual-paradigm.com)	1)Describe the transformation process from analysis to design 2) Discuss software Design concepts principles 3)Discuss the characteristics of design classes. 4) Apply concepts to Project Assignment	Lecture Slides from Text re-enforced by example cases from Visual Paradigm and other sources Lab Project Part A	Group Project Assignment A Review 1%. Connect Quiz 1 - Chapter 8 -- 1%	Week 2
3	Software Design Concepts & Principles -	1) Required Text Chapter 9	1) Elaborate on design concepts and principles	Lecture Slides from Text re-	Group Project Assignment Part A Review	Week 3

Week	Topics	Readings/Materials	Weekly Learning Outcome(s)	Instructional Strategies	Evaluation Name and Weight	Evaluation Date
	Continued	2)Visual Paradigm Tutorials - Software Design (www.visual-paradigm.com)	2)Discuss the minimum cost in modularity vs software cost. 3) Develop a design class diagram 4) Discuss information hiding and encapsulation in design classes 5) Apply concepts to Project Assignment	enforced by example cases from Visual Paradigm and other sources Lab Review with student teams Term Project Part A deliverables .	1% Connect Quiz 2 - Chapter 9 -1%	
4	Software Architectural Designs Patterns (Frameworks) -- MVC and MVVM Web Sources: C# .Net Implementation https://www.c-sharpcorner.com/UploadFile/bd5be5/design-patterns-in-net/ Java Implementation https://www.tutorialspoint.com/design_pattern/index.htm	1) Required Text Chapters 10 2) Visual Paradigm Tutorials - Software Architectural Patterns (www.visual-paradigm.com) Weblinks on MVC vs MVVM --	1) Discuss the various components of a Software design architecture with Reference to MVC and MVVM 2) Discuss architectural genres , styles and patterns with a focus on Object Oriented Architecture 3) Discuss the Model View Controller design Framework 4)Apply the MVC Architectural design framework to the project assignment 4) Discuss the Advantages and disadvantages of MVC vs MVVM	Lecture Slides from Text re-enforced by example cases from Visual Paradigm and other sources. Discuss synergies with COMP 246 and COMP 214 & 229 C# .Net Implementation https://www.c-sharpcorner.com/UploadFile/bd5be5/design-patterns-in-net/ Java Implementation https://www.tutorialspoint.com/design_pattern/index.htm Lab Review with Student teams term Project Part A deliverables	Term Project Part A due -- 14% Connect Quiz 3 - Chapter 10 -- 1%	Week 4
5	Part A: Component Level Design	1) Required Text : Chapter 11	1)Discuss software component design principles	Lecture	Group Project Assignment	Week 5

Week	Topics	Readings/Materials	Weekly Learning Outcome(s)	Instructional Strategies	Evaluation Name and Weight	Evaluation Date
		2) Visual Paradigm Tutorials - Design Classes (www.visual-paradigm.com)	2)Explain Class Responsibility Collaboration (CRC). 3) Discuss software design class component as a set of collaborative classes. 4)Provide illustrations of component-Based Standards and its alignment with architectural Frameworks and the iterative methodology 4) Apply concepts to Project Assignment	1) Slides from Text re-enforced by example cases from Visual Paradigm and other sources. 2) Begin the process of reverse engineering LMS used in the course. Lab Mark and provide feedback on term Project Part A deliverables	Part B Review 1% Project Assignment Part B Assigned Connect Quiz 4 - Chapter 11 - 1%	
6	Component Level Design Continued	1) Required Text Chapter 11 2) Visual Paradigm Tutorials - Design Classes and CRC (www.visual-paradigm.com)	1) Discuss design of software component Interfaces 2) Discuss component level design for Web application. 3)Discuss component level design for Mobile App. 4) Discuss the key principle of re-usability in Component design. 5) Apply concepts to the Project Assignment	Lecture Slides from Text re-enforced by example cases from Visual Paradigm and other sources 3) Continue the reverse engineering of the LMS used in the course with emphasis on Content, Grades, Assessment and Communication as components wi.th their accompanying uses cases Lab Review with Student teams term Project Part B deliverables	Group Project Assignment B Review 1% Connect Quiz 5 - Chapter 11 -- 1%	Week 6
7	Mid-term Evaluation Term Test # 1	Required Text: Chapters 8,9,10 & 11	Test # 1 worth 20%	Test #1 Lab: Review with Student Teams Term	Test # 1 -- 20%	Week 7

Week	Topics	Readings/Materials	Weekly Learning Outcome(s)	Instructional Strategies	Evaluation Name and Weight	Evaluation Date
				Part B		
8	User's Experience Design - UI/UX	1) Required Text: Chapter 12 2) Visual Paradigm Tutorials - UI & UX design (www.visual-paradigm.com)	1) Discuss the elements of the User's experience (UX) in the context of the User's Interface (UI) 2)Discuss the Three Golden Rules for UX design 3)Describe the User's Interface and UX design process. 4) Evaluate UI-UX based on a set of criteria 5) Apply concepts to the Project Assignment.	Lecture: Slides from Text re-enforced by example cases from Visual Paradigm and other sources Lab Review with Student teams term Project Part B deliverables	Test # 1 -- Feedback Group Project Assignment Part B Review 1 %	Week 8
9	Design For Mobility -Mobile App. - WebApp	1) Required Text Chapters 12 & 13 2) Visual Paradigm Tutorials -- Design for Mobile and Web (www.visual-paradigm.com)	1) Discuss the Mobile App Development life cycle 2) Explain the Three most common mobile User's Interface Design models. 3) Discuss the criteria for UI/UX design of mobile apps. 4) Discuss the Web Design pyramid in relation to UI/UX 5) Apply UI/UX concepts to Project assignment	Lecture: Slides from Text re-enforced by example cases from Visual Paradigm and other sources. Use real-life examples of Web-based application and mobile applications to illustrate the principles. Lab Work Mark and provide feedback to Student teams on term Project Part B deliverables	Part B Term project due--14% Part C Term Project Assigned Connect Quiz 6 - Chapter 12 - 1%	Week 9
10	Software Design Patterns 1	1) Required Text : Chapter 14 2) Visual Paradigm Tutorials - Design Patterns (www.visual-	1) Explain and discuss Software Design Patterns as best practice -reusable code 2) Identify Software Design Patterns as Creational, Structural and behavioral. 2) Discuss Singleton, adapter and Facade	Lecture: Slides from Text re-enforced by example cases from Visual Paradigm and other	Review part C 1% Connect Quiz 7 - Chapter	Week 10

Week	Topics	Readings/Materials	Weekly Learning Outcome(s)	Instructional Strategies	Evaluation Name and Weight	Evaluation Date
		paradigm.com) 3) Reference links on Software Design Patterns	Patterns 3) Discuss the Generic Structure of Singleton, Adapter and Facade Patterns 4) Discuss the Implementation of Singleton, Adapter and Facade Patterns 5) Apply concepts to the term project	sources. Patterns abound in real life -- use as lead in to software design patterns Project P -Part B Feedback Review with Student teams term Project Part C deliverables	12 -- 1%	
11	Software Design Patterns -- 2	1) Required Text : Chapter 14 2) Visual Paradigm Tutorials- Design Patterns (www.visual-paradigm.com) 3) References on Software Design Pattern Web Links	1) Discuss Composite Observer and State Patterns 2) Discuss the Generic Structure of each of these patterns 3) Discuss the Implementation of these patterns 4) Apply concept to the term project	Lecture: Slides from Text re-enforced by example cases from Visual Paradigm and other sources Lab Examples from Internet sources. Review with Student teams term Project Part C deliverables	Group Project Assignment Part C Review 1% Connect Quiz 8 - Chapter 13 -- 1%	Week 11
12	Generative AI and LLMs in Software Development Life Cycle	Required -- Internet Sources: 1) https://www.v2soft.com/blogs/generative-ai-in-sdlc 2) Visual Paradigm Tutorials -Generative AI and LLM (www.visual-paradigm.com) 3) References on	1) Discuss the concepts of Generative AI & LLM 2)Illustrate with examples application of these new technologies. 3) Discuss the integration of OpenAI API, Gemini API, or other LLMs into web and mobile applications 4) Apply Generative AI and LLMS to Students' projects	Lecture: Slides from Text re-enforced by example cases from Visual Paradigm and other sources. Extensive use of Internet web resources on the topic of Generative AI and LLMs. https://www.v2soft.com/blogs/generative-ai-	Group Project Assignment C Review 1% Connect Quiz 9 Chapter 13 -- 1%	Week 12

Week	Topics	Readings/Materials	Weekly Learning Outcome(s)	Instructional Strategies	Evaluation Name and Weight	Evaluation Date
		Software Design Patterns		in-sdlc Lab Review with Student teams term Project Part C deliverables.		
13	Term Project -- Oral Presentation & Feedback	Term Project A,B & C	1) Apply knowledge of course in a review for test# 2 using sample questions. 2) Orally present project with team members taking turn. 3) Evaluate and provide feedback on Term Project	Mark and provide feedback to Student teams on term Project Part C deliverable & Oral Presentation	Connect Quiz 10 - Chapter 14 -- 1% Part C Term Project C is due Term test #2 Review sample questions	Week 13
14	Test 2 & Written Term Project due	Text Chapters 11, 12, 13 & 14 Visual Paradigm Tutorials	Evaluate Course Learning Outcomes	On-Line Test SRS+SDD submitted for evaluation.	Test 2 worth 20 % Part C of Term Project Written documentation packaged with Parts A & B is due -worth 12%	Week 14