Toronto Metropolitan University

Department of Electrical, Computer, & Biomedical Engineering
Faculty of Engineering & Architectural Science

Course Outline (W2026)

COE692: Software Design and Architecture

Instructor(s)	Dr. Faezeh Ensan [Coordinator] Office: ENG324 Phone: (416) 979-5000 x 554904 Email: fensan@torontomu.ca Office Hours: Tuesdays, 3:30 pm - 4:30 pm
Calendar Description	Introduces students to issues, techniques, strategies, representations, and patterns used to implement software systems with an emphasis on the design and implementation of system-level software, large architectural models for System-On-Chip systems, Electronic-Design-Automation tool flows, and embedded systems.
Prerequisites	COE 428, COE 528, CPS 510
Antirequisites	None
Corerequisites	None
Compulsory Text(s):	1. Essential Software Architecture (2nd Edition), Ian Gorton, Springer; 2011 edition
Reference Text(s):	1. Software Architecture in Practice (3nd Edition), Bass, Len, Paul Clements, and Rick Kazman. Addison-Wesley Professional; 2012 2. Object-Oriented Software Engineering. Using UML, Patterns, and Java. Bruegge, Bernd, and Allen H. Dutoit. Learning 5.6 (2009): 7. 3. Microservices Design & Development. From Design to Deployment. Chris Richardson, Floyd Smith. NGINX, Inc. 2016.
Learning Objectives (Indicators)	At the end of this course, the successful student will be able to: 1. Develop practical understanding of various software architecture types and be able to make design decisions under varying design circumstances. (**1d**) 2. Understand and reason about software architecture qualities such as availability, modifiability, performance, security, testability, ad usability. (**4a**) 3. Lead an architectural design process by adopting architectural tactics and patterns. (**4b**), (**6a**) 4. Be able to document a software architecture and be familiar with architecture design languages such as ADDL. (**7c**) 5. Systematically account for economic impact of software architecture design when making architectural design decisions. (**11a**) **NOTE:***Numbers in parentheses refer to the graduate attributes required by the Canadian Engineering Accreditation Board (CEAB).*

Course Organization	3.0 hours of lecture per week for 13 weeks 2.0 hours of lab per week for 12 weeks 0.0 hours of tutorial per week for 12 weeks
Teaching Assistants	Will be announced.
Course Evaluation	

Theory	
Midterm	35 %
Final	25 %
Quiz	5 %
In-Class activities (Extra 5%)	5 %
Laboratory	
Lab	35 %
TOTAL:	100 %

Note: In order for a student to pass a course, a minimum overall course mark of 50% must be obtained. In addition, for courses that have both **"Theory and Laboratory"** components, the student must pass the Laboratory and Theory portions separately by achieving a minimum of 50% in the combined Laboratory components and 50% in the combined Theory components. Please refer to the **"Course Evaluation"** section above for details on the Theory and Laboratory components (if applicable).

Examinations	Midterm will be on Week 7 of the course (in-person, closed book). Quiz will be on Week 10 of the course. Final exam will be in the exam period of the winter semester (The exam format will be announced in D2L).
Other Evaluation Information	Any use of generative AI tools, such as ChatGPT, must be limited to grammar checking and language correctness. Other uses (such as generating diagrams, descriptions, explanations, etc.) are strictly prohibited. Failure to stay within these limits will be considered a breach of Policy 60. Labs are organized in the form of one project. In the first lab, students will become familiar with the development environment. In the second lab, they will define their own project, with each group working on a different subject. Students must work in groups of two for their labs. If there is a single student left without a partner, they may work alone. Your group mate must either be in the same section as you or in a section handled by the same TA as your section. Lab marking will be divided into two types: Individual Marking: Each person in a group must submit their own work and will be graded accordingly. Group Marking: The group will submit the work collectively, and all members will receive the same grade based on the group submission. Lab assignments must be submitted before 11:59 PM on the day before the next scheduled lab. A penalty of 20% will be applied for submissions up to 8 hours late. Assignments submitted more

	than 8 hours late will not be accepted and will receive a grade of 0. You will have 8 in-class activities, each worth 1 mark. You can earn up to 5 extra marks by attending these activities. To be eligible to participate, you must be present in the class.
Teaching Methods	Lectures will be in DCC204 on Tuesdays, 12 pm - 3:00 PM.
Other Information	For this course, students must have access to the following resources: A Windows 10 or macOS X computer with a minimum of: Intel Core i5 processor or equivalent 8 GB RAM 20 GB of available storage space after all applications are installed

Course Content

Week	Hours	Chapters / Section	Topic, description
1	3		Introduction to Software Architecture Introduction to the course Development Environment (Web servers and Application Servers)
2	3		Software Middleware
3-4	6		software architecture quality attributes Software Architecture and Requirements Introduction to the course running example (The library management web application)
5	3		MVC and n-Tier Architecture Styles
6	3		Analyzing architectures and software qualities of case studies

7	3		Midterm
8-9	6		More on Architecture styles (Microservice Architecture)
10	3		Quiz Event Driven Architectures
11-12	3		Software Deployment
13	3		Course Review

Laboratory(L)/Tutorials(T)/Activity(A) Schedule

Week	L/T/A	Description
2-3	L	Development Environment Setup (Apache Tomcat, Java Netbeans, and HTML). Designing a simple Web Application.
4-5	L	Project specification by UML diagrams. Designing a more advanced Web application by Servlets, and forms.
6-8	L	Employing n-Tier Architecture for creating a Web application for the specified project.
9-10	L	Employing Microservice architecture for creating a Web application for the specified project.
11-13	L	Deploying all microservices related to the specified project on Google Cloud.

University Policies & Important Information

Students are reminded that they are required to adhere to all relevant university policies found in their online course shell in D2L and/or on the Senate website

Refer to the Departmental FAQ page for furhter information on common questions.

Important Resources Available at Toronto Metropolitan University

- The University Libraries provide research workshops and individual consultation appointments. There is a drop-in Research Help desk on the second floor of the library, and students can use the Library's virtual research help service to speak with a librarian, or book an appointment to meet in person or online.
- Student Life and Learning Support offers group-based and individual help with writing, math, study skills, and transition support, as well as resources and checklists to support students as online learners.
- You can submit an Academic Consideration Request when an extenuating circumstance has occurred that has significantly impacted your ability to fulfill an academic requirement. You may always visit the Senate website and select the blue radio button on the top right hand side entitled: Academic Consideration Request (ACR) to submit this request.

  For Extenuating Circumstances, Policy 167: Academic Consideration allows for a once per semester ACR request without supporting documentation if the absence is less than 3 days in duration and is not for a final exam/final assessment. Absences more than 3 days in duration and those that involve a final exam/final assessment, always require documentation. Students must notify their faculty/contract lecturer once a request for academic consideration is submitted. See Senate Policy 167: Academic Consideration.

  Longer absences are not addressed through Policy 167 and should be discussed with your Chair/Director/Program to be advised on next steps.

- FAQs Academic Considerations and Appeals
- Information on Copyright for Faculty/Contract Lecturers and students.

Lab Safety (if applicable)

Students are to strictly adhere and follow:

a. The Lab Safety information/guidelines posted in the respective labs,
b. provided in their respective lab handouts, and
c. instructions provided by the Teaching Assistants/Course instructors/Technical Staff.

During the lab sessions, to avoid tripping hazards, the area around the lab stations should not be surrounded by bags, backpacks etc, students should place their bags, backpacks etc against the walls of the labs and/or away from their lab stations in such a way that it avoids tripping hazards.

Accessibility

- Similar to an accessibility statement, use this section to describe your commitment to making this course accessible to students with disabilities. Improving the accessibility of your course helps minimize the need for accommodation.
- Outline any technologies used in this course and any known accessibility features or barriers (if applicable).
- Describe how a student should contact you if they discover an accessibility barrier with any course materials or technologies.

Academic Accommodation Support

Academic Accommodation Support (AAS) is the university's disability services office. AAS works directly with incoming and returning students looking for help with their academic accommodations. AAS works with any student who requires academic accommodation regardless of program or course load.

- Learn more about Academic Accommodation Support.
- Learn how to register with AAS.
- Learn about Policy 159: Academic Accommodation of Students with Disabilities

Academic Accommodations (for students with disabilities) and Academic Consideration (for students faced with extenuating circumstances that can include short-term health issues) are governed by two different university policies. Learn more about Academic Accommodations versus Academic Consideration and how to access each.

Wellbeing Support

At Toronto Metropolitan University, we recognize that things can come up throughout the term that may interfere with a student's ability to succeed in their coursework. These circumstances are outside of one's control and can have a serious impact on physical and mental well-being. Seeking help can be a challenge, especially in those times of crisis.

If you are experiencing a mental health crisis, please call 911 and go to the nearest hospital emergency room. You can also access these outside resources at anytime:

- **Distress Line:**24/7 line for if you are in crisis, feeling suicidal or in need of emotional support (phone: 416-408-4357)
- **Good2Talk:**24/7-hour line for postsecondary students (phone: 1-866-925-5454)
- **Keep.meSAFE:** 24/7 access to confidential support through counsellors via My SSP app or 1-844-451-9700

If non-crisis support is needed, you can access these campus resources:

- **Centre for Student Development and Counselling:** 416-979-5195 or email csdc@torontomu.ca
- **Consent Comes First - Office of Sexual Violence Support and Education:** 416-919-5000 ext 3596 or email osvse@torontomu.ca
- **Medical Centre:** call (416) 979-5070 to book an appointment

We encourage all Toronto Metropolitan University community members to access available resources to ensure support is reachable. You can find more resources available through the Toronto Metropolitan University Mental Health and Wellbeing website.