Course Outline (F2023)

BME506: Introduction to Software

Instructor(s)	Dr. Olivia Das [Coordinator] Office: ENG464 Phone: (416) 979-5000 x 556114 Email: odas@torontomu.ca Office Hours: TBA
Calendar Description	This course introduces Biomedical Engineers to the principles and processes governing software design and development. Software development processes are explored in the context of procedural and object-oriented paradigms (C/C++). Topics include requirements analysis/specifications, detailed design and implementation, testing, inspection and debugging. Decomposition into classes and modules is examined from the point of view of data-flow, entity-relationships, and the unified modeling language (UML). Students will learn how to leverage industry standard tools for design and development. Laboratory work will focus on applications relating to biomedical engineering.
Prerequisites	BME 328 and CEN 199
Antirequisites	COE 318
Corerequisites	None
Compulsory Text(s):	1. A Concise Introduction to Software Engineering, Pankaj Jalote, (Undergraduate topics in Computer Science) ISBN-10:1848003013 | ISBN-13:978-1848003019 | Edition: 2008.
Reference Text(s):	1. C++ Primer Plus, Stephen Prata (6th Ed.), Publication Date: October 28, 2011, ISBN-10: 0321776402 | ISBN-13: 978-0321776402. 2. Design Patterns: Elements of Reusable Object-Oriented Software, Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, 1995, Addison-Wesley Professional, First Edition, ISBN 0201633612.
Learning Objectives (Indicators)	At the end of this course, the successful student will be able to: 1. Demonstrate an in-depth understanding of key concepts related to procedural and object-oriented software engineering fundamentals. Apply procedural and object-oriented programming knowledge to solve software engineering problems. (**1c**) 2. Use the knowledge of procedural and object-oriented software design. Apply software engineering principles and theories to define an accurate problem statement through approaches such as use cases. (**4a**) 3. Use relevant techniques and tools for requirements analysis, design, and implementation of software. (**5a**) 4. Illustrate concepts of various stages of software development through appropriate graphical forms. (**7c**) **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	1- Carol Wasef (carol.wasef@torontomu.ca) 2- Matthew Lam (matthew1.lam@torontomu.ca)	

Course Evaluation

Theory	
Quiz Exam	5 %
Midterm Exam	20 %
Final Exam	45 %
Laboratory	
Labs	30 %
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 exam, (covers Weeks 1-6, tentative). Final exam, (covers weeks 1-13).
Other Evaluation Information	None
Teaching Methods	Zoom and D2L Brightspace will be used.
Other Information	None

Course Content

Week	Hours	Chapters / Section	Topic, description
1	3		Introduction. (Lecture notes. Slides).

			C++ Basics & Control Flow. (Lecture notes. Slides).
2	3		Software Development Process. Requirements Analysis & Specifications. Functional/Non-functional requirements. (Lecture notes. Slides). C++ Functions. Function parameter(s). Function Overloading. (Lecture notes. Slides).
3	3		C++ Arrays. C-String. Pointers. (Lecture notes. Slides).
4	3		User Defined Data Types: C++ Enums and Structs. File I/O. (Lecture notes. Slides).
5	3		Stack and Queue. (Lecture notes. Slides).
6	3		OO - Introduction to Classes. Data Access. Member Functions & Constructors. Dynamic Memory and Destructors. (Lecture notes. Slides).
7	3		OO - Using Classes. Using C++ Classes. (Lecture notes. Slides). MIDTERM EXAM.
8	3		OO - Encapsulation. C++ Encapsulation. (Lecture notes. Slides).
9	3		OO - Inheritance. Polymorphism. (Lecture notes. Slides). C++ Abstract Classes. Inheritance. Polymorphism. (Lecture notes. Slides).

10	3		OO - UML Diagrams: Use Case Diagram. Class Diagram. (Lecture notes. Slides). Introduction to Design Patterns. (Lecture notes. Slides).
11	3		Design Patterns (Continued). (Lecture notes. Slides).
12	3		OO - Advanced Topics: Exception handling. (Lecture notes. Slides).
13	3		Course Review.

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

Week	L/T/A	Description
2	Lab0	Installation of Netbeans. Practice with Project Creation in Netbeans. (0 marks)
3	Lab1	Functions and Control Flow. (3 marks)
4	Lab2	Arrays and Command Line Arguments. (3 marks)
5	Lab3	Practice with Pointers. (3 marks)
6-7	Lab4	User Defined Types and File IO. (3 marks)
8-9	Lab5	Object-Oriented Design and Implementation of a simple application. (6 marks)

10-11	Lab6	Inheritance and Polymorphism. (6 marks)
12	Lab7	Design Patterns. (6 marks)

University Policies

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

Important Resources Available at Toronto Metropolitan University

- The Library provides research workshops and individual assistance. If the University is open, there is a Research Help desk on the second floor of the library, or students can use the Library's virtual research help service to speak with a librarian.
- 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, require documentation. Students must notify their instructor once a request for academic consideration is submitted. See Senate Policy 167: Academic Consideration.

- If taking a remote course, familiarize yourself with the tools you will need to use for remote learning. The Remote Learning Guide for students includes guides to completing quizzes or exams in D2L Brightspace, with or without Respondus LockDown Browser and Monitor, using D2L Brightspace, joining online meetings or lectures, and collaborating with the Google Suite.
- Information on Copyright for Faculty and students.

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.

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.