

# SFWRENG 3XB3

## *Software Engineering Practice & Experience: Binding Theory to Practice (Fall 2022)*

## INSTRUCTORS

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- Teaching assistants:
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## GENERAL INFORMATION

### CALENDAR DESCRIPTION

*Open-ended design of computational solutions to practical problems that involve both theoretical (algorithmic) analysis and implementation; solving computational problems through an experiential approach. Applications to embedded systems, including assembly programming*

### LEARNING OBJECTIVES

This course build upon the theoretical knowledge acquired in **SFWRENG 2AA4** (*Introduction to Software Development*), **SFWRENG 2CO3** (*Data Structures and Algorithms*) and **SFWRENG 2GA3** (*Computer Architecture*).

At the end of the course, students should:

- **Know and understand:**
  - The impact of choosing one data structure instead of another one;
  - That measuring and evaluating performances is a complex task;
  - The impact of abstraction layers (from assembly to object-oriented code)
- **Be able to:**
  - Design object-oriented python code using state-of-practice tools
  - Implement efficiently state-of-the art algorithms and data structure
  - Implement efficient benchmarks according to relevant evaluation dimensions
  - Analyse the results of benchmarks to provide engineering recommendations

### COURSE PAGE

The course uses *Avenue To Learn* for pedagogical material. Additionally, a Gitlab repository (available at: <https://gitlab.cas.mcmaster.ca/sfwreng-3xb3-fall-22/lecture-material>) contains additional material such as the code used during the lectures.

## SCHEDULE

Labs start on the first week (Tuesday 6<sup>th</sup>), before the first lecture.

According to McMaster “Back to Mac” policy, lectures and labs are “in-person” ones.

Type	Slot	Mo.	Tu.	We.		Th.	Fr.	
Labs	08:30		L02	L01	L04	L02	L01	L04
	10:20		BSB 249	BSB 249	BSB 244	BSB 249	BSB 249	BSB 244
	12:30		L03			L03		
	2:20		BSB 249			BSB 249		
Lecture	12:30						C01 - BSB 147	
	1:20							

- Attendance to lectures and labs is mandatory
- No lecture on Friday 30<sup>th</sup> (National Day for Truth and Reconciliation)
- For fairness reasons among the different sections, there will be only one lab on week #39 and week #49.
- When the lecture is an invited one, the lecture will happen on Zoom. It is still possible to gather in the lecture room and attend it physically, but remote attendance will also be possible.
- Lectures recording (through Echo 360) will be available to accommodate student who have to exceptionally miss a lecture. There is no guarantee that a given lecture will be available, as technical issues can happen.
- Except for the invited lectures, the course will not be live-streamed.

## TEXTBOOK AND COURSE MATERIAL

No textbook is mandatory for this course: course material (PDF version of lecture slides) will be available on the Avenue page and are sufficient for the new content covered in the course. That being said, as the course build on top of 2AA4, 2C03 and 2GA3, the material covered in these three courses will not be covered again.

The following books are “recommended” books that complements the course material:

- Cracking the coding Interview (Gayle Laakmann McDowell)
- Guide to competitive programming (Antti Laaksonen)
- Computer systems (J. Stanley Warford)

## ONLINE COMPONENT & COMMUNICATION

The course uses Avenue as main website, to make available lecture material, recording (when possible), and assignments. To store code, we will use the departmental gitlab instance.

We will use MS Teams as one and only communication media to support interaction between students and course’s staff (professor and TAs). To respect the work-life balance of the staff, the MS Teams channels and direct messages will be monitored during “regular” working hours (9AM – 6PM, weekdays only). We will try to answer to your questions in a timely manner, and with a maximum of two business day.

**Particularly, email communication will not be processed**

To properly communicate during the course:

- If your question/comment is general and applies for multiple students, please start a conversation in the relevant public channel in the 3XB3 team;



- If your question/comment is related to your particular case, open a direct message discussion with both (i) your TA and (i) the instructor. Based on the contents of your message, you might be redirected to a public channel.

## COURSE CONTENTS

### OUTLINE

The course will (tentatively) cover the following topics.

#Week	Lecture date	Topic	Instructor
#36	09/09/2022	Welcome to 3XB3	S. Mosser
#37	16/09/2022	Benchmarking sorting algorithms	
#38	23/09/2022	Technical optimizations <i>versus</i> domain heuristics	
#39	30/09/2022	<i>National Day of Truth and Reconciliation (no lecture)</i>	
#40	07/10/2022	Data structure variations: Priority Queues	S. Mosser
#41	14/10/2022	<i>Midterm recess (no lecture)</i>	
#42	21/10/2022	Manipulating Trees: the Huffman coding example	S. Mosser
#43	28/10/2022	Guest Lecture (Zoom)	TBA
#44	04/11/2022	Manipulating Sets: the stable marriage problem	S. Mosser
#45	11/11/2022	Assembly programming with the Pep/9 environment	
#46	18/11/2022	Translating procedural code to assembly	
#47	25/11/2022	Guest Lecture (Zoom)	TBA
#48	02/12/2022	Wrapping up 3XB3	S. Mosser

- Guest lecturers are still tentative (technical details/logistics to be sorted out)
- The instructor reserves the right to modify this tentative planning during the term. If any type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes

### GRADING & EVALUATION

The course contains five (5) graded assignments: three (3) labs and two (2) coding competitions. A final exam wraps the course content during the examination period. The final (literal) grade is computed as a weighted average of the different assignments, as described in the table below.

ID	Assignment	Kind	Weight	Start date	Delivery date
	Warm-up (not graded)	<i>Individual</i>	0%	06/09/2022	09/09/2022
L1	Graph lab	<i>Team (2-3)</i>	20%	10/09/2022	02/10/2022
C1	Code Competition #1	<i>Individual</i>	15%	03/10/2022	09/10/2022
L2	Bin packing lab	<i>Team (2-3)</i>	20%	17/10/2022	06/11/2022
C2	Code Competition #2	<i>Individual</i>	15%	07/11/2022	13/11/2022
L3	Assembly lab	<i>Team (2-3)</i>	10%	14/11/2022	08/12/2022
EX	Final exam (3 hours)	<i>Individual</i>	20%	<i>To be announced (registrar)</i>	

- Assignments reports are delivered thanks to Avenue. Code are hosted on the departmental Gitlab instance.
- Assignments are graded on a [0,100] scale.
- Deliveries are expected at 23:59 (Toronto time). There is no credit for deliveries handed in after the deadline.
- The instructor reserves the right to modify this planning during the term. If any type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes



- As a student, you will not be evaluated by the TA in charge of your lab section.
- Labs are expected to be executed by groups of two (2) students, member of the same lab section. In case of an odd number of students in a section, it will be possible to work as a group of three (3) students. Additional expectations for such groups will be discussed with the TA.
- Labs spans across multiple weeks. Weekly report including progress description are expected on Avenue.
- Code Competition will be supported by the DomJudge online platform.
- The final exam will be scheduled by the registrar's office. It is a "closed book" exam, and covers all topics covered in class and during assignments.
- The instructor reserves the right to conduct any deferred midterm or final exam orally.

## ACADEMIC INTEGRITY & PLAGIARISM<sup>1</sup>

Code delivered as part of (i) labs and (ii) code competitions will be evaluated using state-of-the-art code plagiarism detector. You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

Individual assignments (C1, C2, EX) must be solved by one person only, **any** outside source, this includes asking other people, or using any books or information found on the web **has** to be documented. In compliance with the senate regulations on academic integrity I remind you that: **People who let other people copy are as guilty as the ones who copy**. You are allowed to consult outside sources, meaning textbooks or the web, but **any** use of an outside source **must** be documented.

Similarly, group assignments must be solved by members of that group only, and the University policies apply as well (see "Advisory Statements" below).

## MAPPING TO GRADUATE ATTRIBUTES (PRELIMINARY)

Attribute	Indicator		Evaluation		
			Labs	Comp.	Ex.
Knowledge Base	1.3	Competence in Engineering Fundamentals	✓		✓
Problem analysis	2.1	Identifies and states reasonable assumptions and suitable engineering fundamentals, before proposing a solution path to a problem	✓		✓
	2.2	Proposes problem solutions supported by substantiated reasoning, recognizing the limitations of the solutions	✓	✓	✓
Investigation	3.1	Selects appropriately from relevant knowledge base to plan appropriate data collection methods and analysis strategies	✓	✓	✓
	3.2	Synthesizes the results of an investigation to reach valid conclusions	✓		
Design	4.1	Defines the problem by identifying relevant context, constraints, and prior approaches before exploring potential design solutions	✓	✓	✓

<sup>1</sup> Adapted from Dr. Jacques Carette outline for SFWRENG 3GB3 – Fall 2021

	4.2	Explores a breadth of potential solutions, considering their benefits and trade-offs as they relate to the project requirements	✓	✓	
	4.3	Develops models/prototypes; tests, evaluates, and iterates as appropriate	✓	✓	
	4.4	Justifies and reflects on design decisions, giving consideration to limitations, assumptions, constraints and other relevant factors	✓	✓	✓
Use of engineering tools	5.1	Evaluates engineering tools, identifies their limitations, and selects, adapts, or extends them appropriately			✓
	5.2	Successfully uses engineering tools	✓	✓	
Individual & Teamwork	6.1	Actively contributes to the planning and execution of a team project	✓		
	6.3	Manages interpersonal relationships, taking leadership responsibilities as needed	✓		
Professionalism	8.1	Describes the duty of a Professional Engineer to the public, client, employer, and the profession			✓
	8.2	Integrates appropriate standards, codes, legal and regulatory factors into decision making			✓
Impact of engineering on society and the environment	9.1	Evaluates the environmental impact of engineering activities, identifies uncertainties in decisions, and promotes sustainable design	✓		✓
Ethics and Equity	10.1	Applies ethical frameworks and reasoning, including in situations where there are possible conflicting interests among the stakeholders			✓
Economics and Project Management	11.1	Applies economic principles in decision making	✓		✓
	11.2	Plans and effectively manages a project's time, resources, and scope, following business practices as appropriate	✓		
	11.3	Identifies, characterizes, assesses, and manages risks to project success	✓		
Life-long learning	12.1	Critically assesses one's own educational needs and opportunities for growth	✓	✓	

## ADVISORY STATEMENTS

### ACADEMIC INTEGRITY

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. **It is your responsibility to understand what constitutes academic dishonesty.**

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, *e.g.* the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: “*Grade of F assigned for academic dishonesty*”), and/or suspension or expulsion from the university. For information on the

various types of academic dishonesty please refer to the **Academic Integrity Policy**, located at <https://secretariat.mcmaster.ca/university-policies-proceduresguidelines/>

The following illustrates only three forms of academic dishonesty:

- plagiarism, *e.g.* the submission of work that is not one's own or for which other credit has been obtained.
- improper collaboration in group work.
- copying or using unauthorized aids in tests and examinations.

## AUTHENTICITY / PLAGIARISM

**Some courses may** use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. Avenue to Learn, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. **All submitted work is subject to normal verification that standards of academic integrity have been upheld** (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com please go to [www.mcmaster.ca/academicintegrity](http://www.mcmaster.ca/academicintegrity).

## COURSES WITH AN ON-LINE COMPONENT

**Some courses may** use on-line elements (*e.g.* e-mail, Avenue to Learn, LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

## ONLINE PROCTORING

**Some courses may** use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

## CONDUCT EXPECTATIONS

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the [Code of Student Rights & Responsibilities](#) (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, **whether in person or online**.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.



## ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES

Students with disabilities who require academic accommodation must contact [Student Accessibility Services \(SAS\)](#) at 905-525-9140 ext. 28652 or [sas@mcmaster.ca](mailto:sas@mcmaster.ca) to make arrangements with a Program Coordinator. For further information, consult McMaster University's [Academic Accommodation of Students with Disabilities policy](#).

## REQUESTS FOR RELIEF FOR MISSED ACADEMIC TERM WORK

In the event of an absence for medical or other reasons, students should review and follow the [Policy on Requests for Relief for Missed Academic Term Work](#).

## ACADEMIC ACCOMMODATION FOR RELIGIOUS, INDIGENOUS OR SPIRITUAL OBSERVANCES (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the [RISO](#) policy. Students should submit their request to their Faculty Office **normally within 10 working days** of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

## COPYRIGHT AND RECORDING

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, **including lectures** by University instructors.

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

## EXTREME CIRCUMSTANCES

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, Avenue to Learn and/or McMaster email.