EECS4315: Mission-Critical Systems
Section Z – Winter 2025

Course Syllabus

1 COURSE POLICIES

1. **Labs**

   You will receive **full** marks <u>as long as</u> successful submissions are made by the corresponding **submission deadlines**, which are enforced **strictly**.

   The format of your labs and that of the subsequent programming tests are **identical**. Therefore, it would be your best interest in following the **export/submission process** (for which you will be expected to complete alone during the programming tests) and submitting work that:
   - complies with the instructions (so as to avoid penalties when you submit for grading in the actual programming tests); and
   - represents your **true** and **best** attempt.

   The rationales of this policy are that: **1)** you can **rest assured that you will <u>not</u> lose any marks from labs (as long as you submit them by the deadlines)**; and **2) you can just focus on the learning by seeking help from colleagues, TAs, and your section instructor without worrying about violating the academic honesty policy**.

   Please do not abuse this policy: **you are still 100% responsible for acquiring the intended understandings and skills from these labs**. Be advised that **later scheduled (<u>written</u> and <u>programming</u>) tests, as well as the final written exam, will be based on these labs**, so if you chose **<u>not</u>** to learn the materials responsibly (e.g., relying much on your colleagues, submitting incomplete work and only intending to look at solutions when they are made available), you would risk at **<u>poor performance</u>** in subsequent tests and the exam.

2. **LAB/TEST DEADLINES**

   Stringent deadlines are imposed on <u>all</u> scheduled in-person **written** tests, scheduled in-person **programming** tests, and **labs** (to be submitted remotely via the *web submit* to the EECS server).

   An in-person, written **exam** will be scheduled by the registrar office to take place during the **exam period**.

   It is your **<u>sole</u>** responsibility for meeting all these deadlines.

3. **Test Dates and Locations**

   For each test, it is your **<u>sole</u>** responsibility for ensuring that you are available to take the test (during the chosen scheduled lab session in LAS 1006).

Programming Test 1	Thursday, February 13
Written Test 1	Thursday, March 6
Programming Test 2	Thursday, March 20
Written Test 2	Thursday, March 27

4. **No Team Work Allowed for Scheduled Tests**

   All **written & programming tests** are to be completed **individually**.

5. **Plagiarism**: When submitting each of your <u>written</u> tests and **programming** tests, you claim that it is solely your work. It is considered as a violation of academic integrity if you <u>copy</u> or <u>share</u> **any** parts of your work (e.g., code, notes) during **any** stage of your development. The instructor and TAs may examine all submissions, and suspicious ones will be reported *immediately* to Lassonde as *a breach of academic integrity*. **We do not tolerate academic dishonesty**.

6. **Missed Tests**

   It is your <u>**sole**</u> responsibility for initiating the communication by the set deadline, or a grade penalty (e.g., a zero for the test) may be applied. If you missed a (programming or written) test:
   – Contact your instructor <u>by the end of the test day</u> in order to gain the approval to write a makeup test.
   The approval is by the judgement of your instructor and may <u>**not**</u> be assumed as automatic.
   – Once approved, assume that there will be a **makeup programming test** scheduled on the <u>following week</u> (during the work hours on a week day).
   This is the only makeup opportunity that can be offerred, and once its exact time is set, you are supposed to prioritize with and accommodate for it.

7. **Accommodation**
   – Contact your instructor by the end of the 1st week (**Friday, Jan 10**).
   – For each programming test, you will write them in an EECS lab machie, set up with the appropriate accommodation. Therefore, please:
     - <u>cancel</u> bookings of both <u>programming tests</u> with the alternate exam centre;
     - <u>discuss</u> how the <u>written</u> test will be accommodated with your instructor;
     - <u>keep</u> your booking of the final exam.

   You are supposed to prioritize and accommodate with the time that is set for your programming test. Please inform your section instructor, at the first contact, of the scheduling contraints on your end.

8. **LATE ENROLMENT**: Students who are not yet officially registered should <u>assume</u> an eventual successful enrolment into the course and are responsible for: **1)** contacting the instructor **within Week 1** for course information (e.g., lecture materials, labs access and deadlines); and **2)** attending lectures, submitting labs, and taking scheduled tests in time.

   No lab deadline extensions or deferred tests due to late enrolment will be accommodated.

2   Instructors

– Chen-Wei (Jackie) Wang
  - Contact: jackie@eecs.yorku.ca   (https://www.eecs.yorku.ca/~jackie/)

    > Jackie believes that **in-person** communication is the *most effective* for attending to your questions/concerns related course materials and grading. When you receive slow or no responses to your email inquiries, it is often an indication that Jackie is happy to help you during his **in-person** office hours and/or appointments.

  - Office Hours:
    * 15:00 – 16:00, Mondays, Tuesdays, Wednesdays, Thursdays
    * These office hours will take place **in-person**.
    * Connecting via **Zoom** in these hours is possible, but please understand that <u>priorities</u> will be given to your fellow students showing up **in-person**.
    * by appointments (Zoom or In-Person)

    Campus Office: Lassonde Building, Room 2043   [19, D5 in the Keele campus]
    Virtual Office: https://yorku.zoom.us/my/jackie.loves.oxford

3   Venues

– In-Class Lectures
  - 13:00 – 14:30, Mondays
    R N203 (Ross Building North)   [D5/28 on the Keele Campus Map]
  - 13:00 – 14:30, Wednesdays
    SLH B (Stedman Lecture Halls)   [D6/22 on the Keele Campus Map]
– Scheduled Labs
  - Lab 01: 09:00 – 10:00, Thursdays
    LAS 1006 (Lassonde Building)   [D5/19 on the Keele Campus Map]

4   eClass Site

– A single site for Section Z: https://eclass.yorku.ca/course/view.php?id=120808

5   Study Materials

– The main study materials will be made available on the lectures page:
  https://www.eecs.yorku.ca/~jackie/teaching/lectures/index.html#EECS4315_W25

6   Available Help Resources

– Jackie's office hours   [regular; request appointments if needed]
– TA office hours   [on demand via Zoom; see eClass for TA's contact info]
– Scheduled lab sessions starting on <u>Week 2</u> (attend them to ask TA and/or Jackie questions)

7 Prerequisites

– **General Prerequisites**: A cumulative grade point average (GPA) of 4.50 or better over all previously completed Major EECS courses. The GPA computation excludes all EECS courses that have a second digit 5, or are Co-Op/PEP courses.
– LE/EECS 2030 3.00 <u>or</u> LE/EECS 1030 3.00
– LE/EECS 3342 3.00

8 Course Description

Building on the material in System Specification and Refinement (EECS3342) which is an introduction to mathematical modelling and refinement of systems using deductive methods, this course provides students with a deeper understanding of both deductive and algorithmic methods and tools for ensuring the safety and correctness of mission critical systems (e.g., medical devices such as pacemakers, nuclear reactors and train control systems).

In addition to deductive techniques, the course treats algorithmic methods such as model-checking tools, specification languages such as temporal logic, table based specification methods, real-time systems, and the nature of software certification.

9 Course Learning Outcomes (CLOs)

Upon completion of the course, students are expected to be able to:

Clo1 Explain the importance of safety-, mission-, business-, and security-critical systems.

Clo2 Demonstrate knowledge of the importance of good software engineering practices for critical systems.

Clo3 Use rigorous software engineering methods to develop dependable software applications that are accompanied by certification evidence for their safety and correctness.

Clo4 Demonstrate knowledge of the method and tools using deductive approaches (such as theorem proving).

Clo5 Demonstrate knowledge of methods and tools for algorithmic approaches (such as model checking, bounded satisfiability) etc.

Clo6 Demonstrate knowledge of the theory underlying deductive and algorithmic approaches.

Clo7 Use industrial strength tools associated with the methods on large systems.

10   Grading Scheme

	Subtotal
4 Labs (1.25% each) 5%	
Programming Test 1 10%	28%
Programming Test 2 13%	
Written Test 1 10%	
Written Test 2 12%	72%
Exam (Cumulative) 50%	

11   Final Exam: Cumulative & Substantial

– Your final exam will be *cumulative*: it will cover **all** study materials.
  • It will be an opportunity for you to **continually** *synthesize* topics that are connected.
– Therefore, your final exam will be the **most substantial** grading component.
  • It assesses how competently you can apply the learned concepts and skills.
  • The best preparation is to constantly review and reflect on the covered topics.

12   Expected Weekly Workload

– Lassonde's recommendation is 3 – 4.5 hours per credit: *9 – 13.5 hours* for a 3.00 course.
– "In-Class" Hours:
  • In-Class Lectures   [3 hours]
    Optional: Schedule Labs, Office Hours
– "Out-of-Class" Hours:
  • Completing Lab Assignments, Studying for Lectures/Tests   [6 to 10.5 hours]

13   Mapping Raw Marks to Letter Grades

– For each grading unit, you will receive a **raw mark score** (not necessarily out of 100).
– The **weighted sum** of all grading units will be mapped to its letter grade.
  • Check the common **Grades and Grading Schemes**.
  • e.g., Say there are only two grading units: Exam (60%) and Lab1 (40%).
    Receiving 150 marks (out of 200) for Exam and 2 marks (out of 3) for Lab1 leads to a
    letter grade B (based on the weighted sum $\frac{150}{200} \times 60 + \frac{2}{3} \times 40 \approx 71.7$).

14   ATTENDANCE OF CLASSES: ENCOURAGED & REWARDING

– There are 23 upcoming in-class lectures in total (2 classes $\times$ 12 weeks $-$ first class).

– Attending classes (in-time & focused) is an **indispensable** part of your learning.

– Despite it being your responsibility, Jackie would encourage you to attend classes by the following rewarding scheme:

- Attendance will be taken **randomly** (via iClicker) on X classes ($10 \leq X \leq 23$) $\Rightarrow$ Attendance will be checked somewhere between every class and every other class. In a class where attendance is taken, **one more more checks** may be conducted: your attendance of that class will **not** count if you miss any of the checks. For example, if you wait for the first check to occur and choose to leave right afterwards, your attendance will not count as you may miss the subsequent check(s). That is, your attendance to a class will count **only if** you complete **all** checks.

- Each attendance check will be conducted briefly (e.g., for a few minutes) at sometime between **5 minutes** after class starts and **5 minutes** before class ends.

- **No** makeup attendance will be considered if you missed a check because you, e.g.,
  * arrived late
  * left early
  * did not pay attention or was absent when the attendance check took place

- Please **always** have the iClicker launched on your computer or mobile device:
  * There will be a sign-up sheet to accommodate the **(extremely) rare** occurrences of failed check-ins.
  You will be accommodated to sign on a sheet for **a maximum of 2 classes**.
  $\Rightarrow$ You are **solely** responsible for resolving any technical issues that caused you to fail checking in via the installed iClicker.
  e.g., see: `https://mhe.my.site.com/iclicker/s/article/How-to-Troubleshoot-Your-Connection-to-the-iClicker-Student-App`

- At the end of the semester, say you attended Y classes:

$$
\begin{aligned}
\textbf{if} &\quad Y \geq \lfloor 90\% \cdot X \rfloor &\rightarrow&\quad 5\% \text{ bonus} \\
\textbf{elseif} &\quad Y \geq \lfloor 80\% \cdot X \rfloor &\rightarrow&\quad 4\% \text{ bonus} \\
\textbf{elseif} &\quad Y \geq \lfloor 70\% \cdot X \rfloor &\rightarrow&\quad 2\% \text{ bonus} \\
\textbf{elseif} &\quad Y \geq \lfloor 60\% \cdot X \rfloor &\rightarrow&\quad 1\% \text{ bonus} \\
\textbf{elseif} &\quad Y \geq \lfloor 50\% \cdot X \rfloor &\rightarrow&\quad .5\% \text{ bonus} \\
\textbf{elseif} &\quad Y < \lfloor 50\% \cdot X \rfloor &\rightarrow&\quad \text{no bonus}
\end{aligned}
$$

- For examples:

$X = 23$ (check at every class) $X = 10$ (check at every other class)

$$
\begin{aligned}
\textbf{if} &\quad Y \geq 20.7 &\rightarrow&\quad 5\% \text{ bonus} \\
\textbf{elseif} &\quad Y \geq 18.4 &\rightarrow&\quad 4\% \text{ bonus} \\
\textbf{elseif} &\quad Y \geq 16.1 &\rightarrow&\quad 2\% \text{ bonus} \\
\textbf{elseif} &\quad Y \geq 13.8 &\rightarrow&\quad 1\% \text{ bonus} \\
\textbf{elseif} &\quad Y \geq 11.5 &\rightarrow&\quad .5\% \text{ bonus} \\
\textbf{elseif} &\quad Y < 11.5 &\rightarrow&\quad \text{no bonus}
\end{aligned}
$$

$$
\begin{aligned}
\textbf{if} &\quad Y \geq 9 &\rightarrow&\quad 5\% \text{ bonus} \\
\textbf{elseif} &\quad Y \geq 8 &\rightarrow&\quad 4\% \text{ bonus} \\
\textbf{elseif} &\quad Y \geq 7 &\rightarrow&\quad 2\% \text{ bonus} \\
\textbf{elseif} &\quad Y \geq 6 &\rightarrow&\quad 1\% \text{ bonus} \\
\textbf{elseif} &\quad Y \geq 5 &\rightarrow&\quad .5\% \text{ bonus} \\
\textbf{if} &\quad Y < 5 &\rightarrow&\quad \text{no bonus}
\end{aligned}
$$

– The above rewarding scheme **only** applies to in-class lectures.

– The allowable quota for you to miss classes, so as to get a particular bonus, already accommodates valid excuses (e.g., sick, family emergency).

Therefore:

- once the attendance-taking window expired, **no** late responses will be accepted;
- **no** reasons will be considered for missing attendance checks.

– The instructor reserves the right to **cancel** your bonus if, e.g.:

- you just wait to be taken attendance and leave the class shortly after;
- you attend classes but cause distractions (e.g., talking, using devices for irrelevant activities) to the instructor and/or to other students.

– What should I do to set up the iClicker for attendance checks?

- Refer to this starter guide (to install iClicker on your mobile device):

  https://lthelp.yorku.ca/polling-students/
  iclicker-student-app-quick-start-guide

  When creating an iClicker account, be sure to supply your **student number** and **...@my.yorku.ca** email (you are responsible for **not** receiving the bonus if an invalid student number or email is supplied).
- Ignore the first section "**For Courses using eClass integration**".
- Follow these sections:
  * "**For Courses not using eClass integration**"
  * "**Add Your Instructor iClicker Course**":
    Search for "EECS4315-Z (W25) - Mission-Critical Systems".
  * "**Respond to Polls**"
- When launching iClicker, it is critical that you allow iClicker to use your location; otherwise you will not be able to join the course and take attendance.
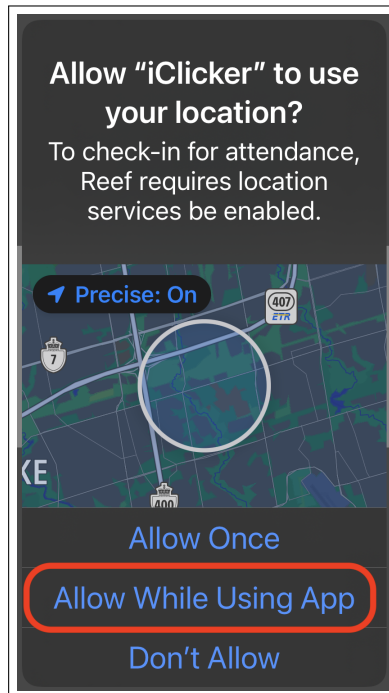
15 Semester Calendar

Figure 1 summarizes the schedule of work items:

- Attend the scheduled in-class lectures on Mondays and Wednesdays (13:00 to 14:30).
- Lab attendance is *optional*: TAs (and often Jackie) will be there to answer your questions related to lab exercises and/or other course materials.
- For weeks where a (written or programming) test is scheduled:
  - The test will occur during the **Thursday scheduled lab session in LAS 1006**.
    Note. Specific details for each test will be announced in advance.
- All announced (written & programming) test dates are **fixed**, unless postponed due to unforeseen factors (e.g., weather condition).
- The lab release dates may be *flexible*. However, once released, you will be given an appropriate amount of time for completion.

Figure 1: EECS4315-Z W25 Semester Calendar – Expected Work Items

16   Coverage of Tests

Tentatively, referencing the semester calendar in Figure 1 (p10):
- <u>Written Test 1</u> covers Lectures 1 – 14
- <u>Written Test 2</u> covers Lectures 15 – 20 (plus some earlier lectures)
- <u>Programming Test 1</u> covers Lab1 and Lab2
- <u>Programming Test 2</u> covers Lab3 (plus parts of Lab1 & Lab2)

17   Weekly Schedule

In the time table below, each cell denotes a 30-minutes interval.
- Cell 18:30 denotes the interval starting at 18:30 and ending at 19:00.
- For example, office hours (on Tuesdays, Wednesdays, and Thursdays) start at 15:30 and end at 16:30.

	Monday	Tuesday	Wednesday	Thursday
8:30				
9:00				EECS4315 Z Lab LAS1006
9:30				EECS4315 Z Lab LAS1006
10:00				
10:30				
11:00				
11:30				
12:00				
12:30				
13:00	EECS4315 Z Lecture R N203		EECS4315 Z Lecture SLH B	
13:30	EECS4315 Z Lecture R N203		EECS4315 Z Lecture SLH B	
14:00	EECS4315 Z Lecture R N203		EECS4315 Z Lecture SLH B	
14:30				
15:00	Office Hour (In-Person, Zoom)			
15:30	Office Hour (In-Person, Zoom)			

18   (Tentative) Lecture Topics

Whereas the pace will be adjusted according to the class dynamics, the following topics are planned to be covered:
- Temporal logic: LTL vs. CTL
- Program Verification: Hoare Logic
- TLA+ and `PlusCal`