ENGG*4420 Real-time Systems Design

01

Fall 2023
Section(s): C01

School of Engineering
Credit Weight: 0.75
Version 1.00 - September 20, 2023

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1 Course Details

1.1 Calendar Description

This course teaches real-time concepts from a system and computing perspective covering topics related to four major areas. Real-time computer control and system modeling area teaches basic real-time design and system modeling concepts for hard and soft real-time computer control applications. Real-time Operating Systems (RTOS) area introduces common kernel objects and inter-task communication and synchronization using examples from current commercial RTOS. Topics in the area of scheduling present theoretical results related to uniprocessor and multiprocessor scheduling algorithms and topics in the area of fault tolerance and reliability present current techniques at software and hardware level.

Pre-Requisites:	ENGG*2400, ENGG*3640
Restrictions:	Non-BENG students may take a maximum of 4.00 ENGG credits.

1.2 Course Description

The course content is organized in four main parts:

1. Real-time computer control with examples; lectures plus laboratory.
2. Real-Time Operating Systems with two examples of commercial RTOS: uC/OS-III and FreeRTOS; lectures plus laboratory.
3. Hard real-time computing systems concepts and scheduling algorithms; presentation of an educational small real-time kernel as an example of RTOS for hard real time computing system; lectures.
4. Study material: reliability and fault tolerance; midterm assignment component.

1.3 Timetable

Lectures:

Tuesday, Thursday: 4 :00 pm – 5:20 pm; MINS 017

Laboratory:

Section 01: Monday, 11:30 am - 2:20 pm; RICH 1504B

Section 02: Friday, 8:30 am - 11:20 am; RICH 1504B

1.4 Final Exam

Date: December 5th, 2023

Time: 2:30 pm to 4:30 pm

Room: TBD

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2 Instructional Support

2.1 Instructional Support Team

Instructor:	Radu Muresan Ph.D., P.Eng.
Email:	rmuresan@uoguelph.ca
Telephone:	+1-519-824-4120 x56730
Office:	RICH 2509
Office Hours:	Friday: Time range: 2:00 pm to 4:00 pm. Or by appointment. Office: RICH 2509
Lab Co-ordinator:	Kevin Dong
Email:	kdong@uoguelph.ca
Telephone:	+1-519-824-4120 x56455
Office:	RICH 2506
Office Hours:	TBD

2.2 Teaching Assistants

Teaching Assistant (GTA):	Yahuza Bello
Email:	ybello@uoguelph.ca
Office Hours:	TBD

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3 Learning Resources

3.1 Required Resources

Engg*4420 Real-Time Systems Design Lecture Notes (Notes)
Author: Radu Muresan, University of Guelph, CourseLink System, 2023

ENGG4420_Lecture_Recordings (Website)
https://web.microsoftstream.com/channel/c54068f8-48f6-4304-8245-c2fc41d40b92
Radu Muresan, 2020, University of Guelph: https://web.microsoftstream.com/channel/c54068f8-48f6-4304-8245-c2fc41d40b92

Engg*4420 Real-Time Systems Design Lab Manual (Lab Manual)
Radu Muresan and Kevin Dong, University of Guelph, CourseLink System, 5th Edition Revised, 2021

HARD REAL-TIME COMPUTING SYSTEMS (Textbook)
Author: Giorgio C. Buttazzo, 3rd Edition, Springer, 2011

MicroC/OS-III The Real-Time Kernel, User Manual (Textbook)
Jean J. Labrosse, Micrium Press, 2016

Mastering the Freertos Real Time Kernel, A Hands-On Tutorial Guide (Textbook)
Richard Barry, Real Time Engineers Ltd. 2016

3.2 Recommended Resources

ENGG*4420 Lectures (Notes)
All the power point lecture notes are posted on the ENGG*4420 CourseLink system (week #1 to week #12) under ENGG4420 LECTURES module.

Feedback Control of Dynamic Systems (Textbook)
Gene F. Franklin, J. David Powell, Abbas Emami-Naeini, 5th Edition, Prentice Hall, 2006.

BEGINNING STM32, DEVELOPING WITH FREERTOS (Textbook)
Warren Gay, Apress, 2018

3.3 Additional Resources

Lectures Information (Notes)
All the lecture notes are posted on the ENGG*4420 CourseLink system (week #1 to week #12) under the LECTURES module. Additional material is found under the eREFERENCES module.

Lab Information (Notes)
The ENGG4420 Lab Manual is posted on the ENGG*4420 CourseLink system under the LABORATORY module.

Midterm Assignment (Notes)
The midterm assignment and and some solutions for previous midterm assignments are posted on the ENGG*4420 Courselink system under the "MIDTERM INDIVIDUAL ASSIGNMENT" module.

Final Exam (Notes)
Some solutions of previous midterm and final exams will be posted on the ENGG*4420 CourseLink system under the PAST EXAMS section.

Final Exam Practice Exercises (Other)
Final exam practice exercises are posted on ENGG*4420 CourseLink under the "Final Exam, Practice Exercises" module.

Miscellaneous Information (Other)
Other information related to real-time systems will be posted on the web page.

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4 Learning Outcomes

The ENGG*4420 course is a senior-level course in most electrical and computer engineering and computer science programs. The main goals of the course are (1) to teach students the fundamental concepts of real-time systems from a system and computing perspective and (2) to teach students how to develop real-time applications using commercial and academic real-time operating systems.

4.1 Course Learning Outcomes

By the end of this course, you should be able to:

1. Efficiently model a system for the purpose of implementing a real-time control system.
2. Efficiently design and implement a real-time control algorithm.
3. Differentiate between different types of tasks (i.e., periodic, aperiodic, soft, hard, non-real time) and properly use these tasks in the design.
4. Choose the appropriate RTOS (Real-Time Operating System) for a specific real-time application.
5. Design and implement real-time applications using commercial RTOS such as uC/OSIII and FreeRTOS, and academic RTOS such as Didactic Kernel. Use of kernel objects and services.
6. Understand and apply in the design of real-time systems the mechanisms of resource access protocols such as priority inversion protocol, the priority ceiling protocol and others.
7. Understand and apply in the design of real-time systems common uniprocessor and multiprocessor scheduling algorithms
8. Understand the design safety and reliability components in real-time systems.
9. Apply the concept of simulation/experimentation for the purpose of designing and testing real-time systems.

10. Model using LabView plant systems for the purpose of implementing real-time controllers as a real-time embedded application.
11. Design of real-time controller software using commercial RTOS development software.
12. Design of complex real-time embedded applications for computing using commercial RTOS development tools
13. Implement and demonstrate computing real-time embedded applications.

4.2 Engineers Canada - Graduate Attributes (2018)

Successfully completing this course will contribute to the following:

#	Outcome	Learning Outcome
1	Knowledge Base	1, 2, 3, 6, 7, 8
1.4	Recall, describe and apply program-specific engineering principles and concepts	1, 2, 3, 6, 7, 8
2	Problem Analysis	1, 2, 5, 6, 8
2.4	Execute an engineering solution	1, 2, 5, 6, 8
4	Design	2, 5, 9, 10, 11, 12, 13
4.2	Construct design-specific problem statements including the definition of criteria and constraints	9
4.3	Create a variety of engineering design solutions	2, 5, 9, 10, 11, 12
4.4	Evaluate alternative design solutions based on problem definition	2, 5, 9, 10, 11, 12
4.5	Develop and refine an engineering design solution, through techniques such as iteration, simulation and/or prototyping	5, 9, 10, 11, 12, 13
5	Use of Engineering Tools	4, 5, 10, 11, 12, 13
5.1	Select appropriate engineering tools from various alternatives	4
5.2	Demonstrate proficiency in the application of selected engineering tools	4, 5, 10, 11, 12, 13
5.3	Recognize limitations of selected engineering tools	4
6	Individual & Teamwork	9, 10, 11, 12, 13

#	Outcome	Learning Outcome
6.1	Describe principles of team dynamics and leadership	9, 10, 11, 12, 13
6.2	Understand all members' roles and responsibilities within a team	9, 10, 11, 12, 13
6.3	Execute and adapt individual role to promote team success through, for example, timeliness, respect, positive attitude	9, 10, 11, 12, 13

4.3 Relationships with other Courses & Labs

Previous Courses:

- **ENGG*2400** (Engineering Systems Analysis): Analytical description and modeling of engineering systems such as electrical, thermal, automotive, and other control systems.
- **ENGG*3640** (Microcomputer interfacing): Interfacing microcomputers to I/O external equipment, developing interfacing routines, understanding of the fabrics of the microcontroller architecture and programming. Understand synchronous and asynchronous serial communication and data acquisition topics.

Follow-on Courses:

- NA

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5 Teaching and Learning Activities

Lecture Delivery:

The ENGG*4420 lectures are all delivered in-class, Face-to-Face (FtF) delivery. The students are encouraged to attend all classes as scheduled. When attending classes, please follow all the recommendations the University of Guelph outlined.

Laboratory Delivery:

The ENGG*4420 laboratory is delivered in-class, Face-to-Face (FtF) delivery. For the FtF lab delivery, we require that groups of students be formed, and all students must attend the laboratory sessions in the lab. Therefore, your participation and attendance are essential so all students will gain much-needed engineering experience. When attending classes, please follow all the recommendations the University of Guelph outlined.

Note:

The lecture and laboratory schedules are given in weeks, considering a 12 weeks term.

5.1 Lecture

Week 1

Topics: Design of Real Time Systems, Introduction, Definitions.

References: Lecture Notes
Learning Outcome: 3

Week 2

Topics: Real-Time Control Systems, Design and Testing Methods, Plant Models

References: Lecture Notes, Lab Manual
Learning Outcome: 1, 2, 3
Design Example; Single-Program Approach; Foreground/Background System; Multi-Tasking Approach;Plant Models: electrical, thermal, and mechanical

Week 2

Topics: Direct Digital Control, Implementation of Real-Time Controllers

References: Lecture Notes, Lab Manual

Learning Outcome: 1, 2
Theory related to the implementation of digital controllers; Methods for implementing a digital controller as a real-time task

Week 3-5

Topics: Real Time Operating Systems, Basic Structure. Commercial RTOS Basics, uC/OS-III Data Structures and Functions

References: Lecture Notes, Lab Manual

Learning Outcome: 4, 5, 6
uC/OS-III Basics; Context Switching; uC/OS-III Objects and Services; uC/OS-III Application Development

Week 5

Topics: Fault Tolerant Schedulability, Safety and Reliability in Real-Time System (Study topic)

References: Lecture Notes
Learning Outcome: 8

Week 6

Topics: Commercial RTOS Basics, FreeRTOS General Functionality

References: Lecture Notes, Lab Manual

Learning Outcome: 4, 5, 6
FreeRTOs Basics; FreeRTOS Objects and Services; FreeRTOS Application Development

Week 7-8

Topics: Kernel Design Issues of a Hard Real-Time Kernel for Critical Control Applications

References: Lecture Notes
Learning Outcome: 4, 5, 6, 8
Small real-time kernel called DICK (Didactic C Kernel) mostly written in C; DICK can handle periodic and aperiodic tasks with explicit time constraints; The problem of time predictable intertask communication is discussed; How the runtime overhead of the kernel can be estimated

Week 9-12

Topics: Hard-Real Time Scheduling Algorithms; Final review lecture will be the last lecture of Week 12.

References: Lecture Notes
Learning Outcome: 7
Basic Concepts; Aperiodic Task Scheduling; Periodic Task Scheduling; Fixed-Priority Servers; Dynamic Priority Servers; Resource Access Protocols

5.2 Lab

Week 1 (Sept. 11 to Sept. 15)

Topics: Introduction to Lab Equipment and Safety Training

References: Lab Manual

Activity:

1. Lab safety presentation, group formation, equipment distribution.

2. Lab 1 introduction.

Week 2 (Sept. 18 to Sept. 22)

Topics: Lab 1: Modeling and control of a hot air plant - simulation/experimentation lab

References: Lab Manual

Learning Outcome: 1, 9, 10
Activity:

1. Lab 1 implementation.

Week 3 (Sept. 25 to Sept. 29)

Topics: Lab 1: Modeling and control of a hot air plant - simulation/experimentation lab

References: Lab Manual
Learning Outcome: 1, 9, 10
Activity:

1. Lab 1 implementation.

Week 4 (Oct. 2 to Oct. 6)

Topics: Lab 2: uC/OS-III and FreeRTOS tutorials and examples

References: Lab Manual
Learning Outcome: 5, 10, 11
Activity:

1. Lab 1 demo and report due.

2. Lab 2 introduction.

Week 5 (Oct. 11 to Oct. 13)

Topics: Lab 2: uC/OS-III and FreeRTOS tutorials and examples

References: Lab Manual
Learning Outcome: 5, 11, 13
Activity:

1. Lab 2 implementation.

Week 6 (Oct. 16 to Oct. 20)

Topics: Lab 3: Real-Time embedded controller of a hot air plant using an RTOS

References: Lab Manual
Learning Outcome: 1, 2, 3, 9, 10, 11, 13

Activity:

1. Lab 2 demo and report due.

2. Lab 3 introduction.

Week 7 (Oct. 23 to Oct. 27)

Topics: Lab 3: Real-Time embedded controller of a hot air plant using an RTOS

References: Lab Manual

Learning Outcome: 1, 2, 3, 9, 10, 11, 12, 13
Activity:

1. Lab 3 implementation.

Week 8 (Oct. 30 to Nov. 3)

Topics: Lab 4/Project: Real-Time home security system project

References: Lab Manual

Learning Outcome: 3, 4, 5, 9, 10, 11, 12, 13
Activity:

1. Lab 3 demo and report due.

2. Lab 4/Project introduction.

Week 9 to 11 (Nov. 6 to Nov. 24)

Topics: Lab 4/Project: Real-Time home security system project

References: Lab Manual
Learning Outcome: 3, 4, 5, 9, 12, 13
Activity:

1. Lab 4/Project implementation.

Week 12 (Nov. 27 to Dec. 1)

Topics: Lab 4/Project: Real-Time home security system project

References: Lab Manual

Learning Outcome: 3, 4, 5, 9, 12, 13
Activity:

1. Lab 4/Project demo and report due.

5.3 Other Important Dates

First day of class: Thursday, September 7, 2023

Friday October 6, 2023: Fall Break begins at the end of classes this day

Monday, October 9, 2023 - no classes scheduled this day; classes rescheduled for Friday December 1

Tuesday, October 10, 2023 - no classes scheduled this day; classes rescheduled for Thursday November 30.

Monday, December 4, 2023: Final Examination period commences.

XXX, December xx, 2023: Final exam starting at xx.

You can also refer to the undergraduate calendar for the semester's scheduled dates.

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6 Assessments

The assessment schedule will be as presented in this section.
Please note that the course requires face-to-face (FtF) delivery. Therefore, all students will be required to participate in the in-class lectures and the in-lab activities, including all lab presentations, lab demos, and implementations.
The course does not have a midterm exam, instead we have an individual take home design type assignment.
The course has a final exam scheduled as a regular FtF in-class exam. Please follow the CourseLink for specific information.

6.1 Marking Schemes & Distributions

Name	Scheme A (%)	Scheme B (%)	Scheme C (%)	Scheme D (%)
Labs	50	40	50	40
Assignment, individual	10	10	0	0
Final Exam	40	50	50	60

Name	Scheme A (%)	Scheme B (%)	Scheme C (%)	Scheme D (%)
Total	100	100	100	100

6.2 Assessment Details

Labs (50%)

Learning Outcome: 1, 2, 3, 4, 5, 9, 10, 11, 12, 13
Lab 1: 10 % total (demo 5%, report 5%)

Lab 2: 6% total (demo 3%, report 3%)

Lab 3: 14 % (demo 7%, report 7%)

Lab 4/Project: 20% (demo 10%, report 10%)

Individual design assignment (10%)

Date: Sun, Oct 29, Take home assignment
Learning Outcome: 3, 5, 6, 11, 12
Assignment: This assignment is an individual design assessment. A small design problem related to the topics presented in the first part of the course, plus the study topic "Fault Tolerant Schedulability, Safety and Reliability in Real-Time System" (Weeks 1 to 5), will be tested by this midterm. The design will require a simple embedded real-time application design (hardware and software) with safety and reliability features. Also, the assignment might contain research components related to embedded design components. The solution to the assignment must be uploaded in pdf format to the ENGG*4420 CourseLink dropbox for this assignment.
The submission deadline is currently set for October 29, 2023; however, we can change this date to accommodate the unforeseeable workload of the students.

Final Exam (40%)

Date: Tue, Dec 5, 2:30 AM - 4:30 AM, TBD
Learning Outcome: 2, 3, 5, 6, 7, 8
Final Exam: The final exam is scheduled as a regular F2F in-class exam. Please follow the CourseLink for specific information. The final exam will cover the entire material taught in the course.

Self and Peer Evaluation (0%)

Date: Week 12, Virtual
Learning Outcome: 9, 10, 11, 12, 13
This is a self and peer evaluation questionnaire which asks about how you and each of your teammates contributed to the team work during the laboratory activity for this course.

This assessment is for the purpose of providing data for the graduate attribute #6 from our GA list.

Specifically:

6.1.18 Describe principles of team dynamics and leadership

6.2.18 Understand all members' roles and responsibilities within a team

6.3.18 Execute and adapt individual role to promote team success through, for example, timeliness, respect, positive attitude

6.3 Course Grading Policies

Missed Assessments: If you are unable to meet an in-course requirement due to medical, psychological, or compassionate reasons, please email the course instructor. See the undergraduate calendar for information on regulations and procedures for Academic Consideration: http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

Accommodation of Religious Obligations: If you are unable to meet an in-course requirement due to religious obligations, please email the course instructor at the start of the semester to make alternate arrangements. See the undergraduate calendar for information on regulations and procedures for Academic Accommodation of Religious Obligations: http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-accomrelig.shtml

Passing grade: In order to pass the ENGG*4420 course, you must meet the following conditions:

1. Students must finalize and submit all the labs (Demo + Report) and obtain a passing grade of 50% or higher in each lab. If an overall grade below 50% is received in any individual lab, the students must arrange with the instructor and the teaching assistant to reschedule a new demo and report submission.
2. In order to pass the course, following marking distribution scheme A, students must score 40% or better in the final exam.
3. If the course passing conditions 1 is not met then the final course grade will be a fail set at 47%.
4. If the course passing condition 2 is not met, the final course mark will be calculated based on marking distribution scheme B.
5. A missed midterm assignment file will be graded with 0. However, in case of a more extended period of sickness prior to the due date of the assignment, you would have

two options:

1. Option 1: the midterm assignment mark is combined with the final, so the course marking scheme applied would be scheme C. However, you would need to score over 40% in the final exam to have the marking C scheme condition applied. If your final exam score is under 40%, then marking scheme D will be used.
2. Option 2: arrange with the instructor a deferred midterm assignment due date, and conditions 1, 2, 3, and 4 will be applied as appropriate.

Contesting marks: Issues with the laboratory, quizzes, and midterm exam marks must be contested within two days from the grade submission.

Lab Work: You must attend and complete all laboratories. If you miss a laboratory demo due to grounds for granting academic consideration or religious accommodation, arrangements must be made with the teaching assistant to complete a makeup lab demo.

Late Lab Reports: Late submissions of lab reports will be accepted only with the approval of the course instructor. However, penalties on late submissions (up to 10% deductions) might be applied.

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7 Course Statements

7.1 F23, Course Delivery

Lecture Delivery:

The ENGG*4420 lectures are all delivered in-class, Face-to-Face (FtF) delivery. The students are encouraged to attend all classes as scheduled. Please follow all the recommendations the University of Guelph outlined when attending classes.

Laboratory Delivery

The ENGG*4420 laboratory is delivered in-class, Face-to-Face (FtF) delivery. For the FtF lab delivery, we require that groups of students be formed, and all students must attend the laboratory sessions in the lab. Therefore, your participation and attendance are essential so all students will gain much-needed engineering experience. Please follow all the recommendations the University of Guelph outlined when attending classes.

8 School of Engineering Statements

8.1 Instructor's Role and Responsibility to Students

The instructor’s role is to develop and deliver course material in ways that facilitate learning

for a variety of students. Selected lecture notes will be made available to students on Courselink but these are not intended to be stand-alone course notes. Some written lecture notes will be presented only in class. During lectures, the instructor will expand and explain the content of notes and provide example problems that supplement posted notes. Scheduled classes will be the principal venue to provide information and feedback for tests and labs.

8.2 Students' Learning Responsibilities

Students are expected to take advantage of the learning opportunities provided during lectures and lab sessions. Students, especially those having difficulty with the course content, should also make use of other resources recommended by the instructor. Students who do (or may) fall behind due to illness, work, or extra-curricular activities are advised to keep the instructor informed. This will allow the instructor to recommend extra resources in a timely manner and/or provide consideration if appropriate.

8.3 Lab Safety

Safety is critically important to the School and is the responsibility of all members of the School: faculty, staff and students. As a student in a lab course you are responsible for taking all reasonable safety precautions and following the lab safety rules specific to the lab you are working in. In addition, you are responsible for reporting all safety issues to the laboratory supervisor, GTA or faculty responsible.

9 University Statements

9.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

9.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

Graduate Calendar - Grounds for Academic Consideration
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml

Associate Diploma Calendar - Academic Consideration, Appeals and Petitions
https://www.uoguelph.ca/registrar/calendars/diploma/current/index.shtml

9.3 Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The

deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml

Graduate Calendar - Registration Changes
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml

Associate Diploma Calendar - Dropping Courses
https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml

9.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

9.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required; however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to make a booking at least 14 days in advance, and no later than November 1 (fall), March 1 (winter) or July 1 (summer). Similarly, new or changed accommodations for online quizzes, tests and exams must be approved at least a week ahead of time.

For Guelph students, information can be found on the SAS website
https://www.uoguelph.ca/sas

For Ridgetown students, information can be found on the Ridgetown SAS website
https://www.ridgetownc.com/services/accessibilityservices.cfm

9.6 Academic Integrity

The University of Guelph is committed to upholding the highest standards of academic integrity, and it is the responsibility of all members of the University community-faculty, staff,

and students-to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff, and students have the responsibility of supporting an environment that encourages academic integrity. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

Undergraduate Calendar - Academic Misconduct
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml

Graduate Calendar - Academic Misconduct
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml

9.7 Recording of Materials

Presentations that are made in relation to course work - including lectures - cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

9.8 Resources

The Academic Calendars are the source of information about the University of Guelph's procedures, policies, and regulations that apply to undergraduate, graduate, and diploma programs.

Academic Calendars
https://www.uoguelph.ca/academics/calendars

9.9 Illness

Medical notes will not normally be required for singular instances of academic consideration, although students may be required to provide supporting documentation for multiple missed assessments or when involving a large part of a course (e.g.. final exam or major assignment).
