ENGG*4420 Real-time Systems Design

01

Fall 2020
Section(s): C01

School of Engineering
Credit Weight: 0.75
Version 2.00 - September 10, 2020

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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

1.2 Timetable

Lectures:

Tuesday, Thursday: 1:00 pm – 2:20 pm

Virtual: https://uoguelph.webex.com/meet/rmuresan

Laboratory:

Section 01: Tuesday 3:00 pm - 5:50 pm RICH 1504B

Section 02: Monday 1:30 pm - 4:20 pm RICH 1504B

Section 03: Wednesday 9:00 am - 11:50 am RICH 1504B

1.3 Final Exam

Thursday, December 10th, 2020: 8:30 am – 10:30 am, Room TBA on WebAdvisor

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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: 1:30 pm to 4:30 pm. Or by appointment Check engg4420 CourseLink Virtual: https://uoguelph.webex.com/meet/rmuresan 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:	Shanhong Liu
Email:	sliu40@uoguelph.ca
Office Hours:	TBD
Teaching Assistant:	Benjamin Dyer
Email:	dyerb@uoguelph.ca

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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, 2020

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, 2020

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

Assignments (Notes)
The assignments are posted on the ENGG*4420 CourseLink system under the ASSIGNMENTS module.

Exams (Other)
Some solutions of previous midterm exams will be posted on the ENGG*4420 CourseLink system under the PAST EXAMS section. Also, after each midterm exam the complete solutions for the exam with the marking scheme applied will be posted for your reference.

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

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4 Learning Outcomes

This course is a senior level course in most electrical and computer engineering programs and in most computer science programs. The main goals of the course are (1) to teach students the fundamental concepts in real-time systems from a system and computing perspective (2) to teach students how to develop real-time applications using modern 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 application.
5. Design and implement real-time applications using commercial RTOS such as uC/OSIII, FreeRTOS, and 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. To 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 controllers using commercial RTOS development software
12. Design 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

#	Outcome	Learning Outcome
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
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

COVID, Lecture Delivery:

The lectures are all delivered in the virtual mode. The students must attend the webex live lecture presentations as scheduled. The link for the lecture presentation is:

https://uoguelph.webex.com/meet/rmuresan

COVID, Laboratory Delivery:

1) Face-to-Face (FTF) Laboratory Delivery. For as long as it is permissible by the University regulations, the laboratory for the course will be delivered in FTF mode. For the FTF lab delivery, we require that groups of 4 students should be formed and at least 1 and at most 2 students per group should be participating to the in-lab activity in order to meet the social distancing requirements. Also, the students will be instructed how to follow all COVID safety requirements. The other members of the group (not present in the lab) must connect using virtual technology and contribute to the lab work through virtual activity. This must be done during the lab hours, and the students are encouraged to work in virtual mode outside the lab hours in order to complete their laboratory work. I addition, the students should rotate their participation to the FTF in-lab activity, meaning that every other week if possible different members of the group should participate to the in-lab activity. This is to allow all students to gain their necessary hands-on engineering experience. If there are students that cannot attend the in-lab activity (due to justifiable reasons) they should try to join a group where they can contribute for the lab through virtual work and the other members agree to this virtual only participation.

2) COVID Development, Alternative to the FTF Lab Delivery. In the case that a new situation related to COVID development will take place during the progression of the fall term (F20), the requirements for the FTF laboratory meetings will be changed to virtual meetings. The laboratory marking scheme will remain unchanged. However, we will make the necessary laboratory adjustments to the laboratory requirements to accommodate the online laboratory delivery. These might include (but not limited to): providing of take home boards, omission of experimental laboratory demos and addition of virtual demos (where possible) or demo reports describing demo procedures.

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 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 9-11

Topics: Hard-Real Time Scheduling Algorithms

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

Week 12

Topics: Fault Tolerant Schedulability, Safety and Reliability in Real-Time System

References: Lecture Notes
Learning Outcome: 8

5.2 Lab

Week 1

Topics: Introduction to Lab Equipment and Safety Training plus COVID Face-to-Face Lab Safety

Week 2

Topics: Lab 1: Hot Air Plant Modeling with LabView. Introduction and Implementation

References: Lab Manual

Learning Outcome: 10
Due:

Week 4: Demo
Week 4: Report

Week 3

Topics: Lab 1: Implementation

References: Lab Manual
Learning Outcome: 10

Week 4

Topics: Lab 1: Demo; Report

Lab 2: RTOS Basics, Introduction and Implementation

References: Lab Manual
Learning Outcome: 10, 11
Lab 2 Due:

Demo: Week 6

Report: Week 6

Week 5

Topics: No Lab this week

References: Lab Manual

Week 6

Topics: Lab 2: Demo; Report

Lab 3: Hot Air Plant Control With RTOS, Introduction and Implementation

References: Lab Manual
Learning Outcome: 11, 13
Lab 3 Due:

Demo: Week 8

Report: Week 8

Week 7

Topics: Lab 3: implementation

References: Lab Manual
Learning Outcome: 10, 11, 13

Week 8

Topics:	Lab 3: Demo; Report Project (Lab 4): Home Security System Project, Introduction Implementation
References:	Lab Manual
Learning Outcome:	10, 11, 12, 13

Lab 4 Due:

Demo: Week 11

Report: Week 11

Week 9-11

Topics:	Lab 4: Design and Implementation
References:	Lab Manual
Learning Outcome:	9, 12, 13

Week 12

Topics:	Lab 4: Demo; Report
Learning Outcome:	9, 12, 13

5.3 Other Important Dates

First day of class: Wednesday, September 9, 2020

Friday October 9, 2020: Fall Break begins at the end of classes this day
Monday, October 12, 2020 - no classes scheduled this day; classes rescheduled for Friday December 4

Tuesday, October 13, 2020 - no classes scheduled this day; classes rescheduled for Thursday December 3

Friday, December 7, 2020: Final Examination commence

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 laboratory requires face-to-face (FTF) delivery which means that at least one student and up to two students per group will be required to be participating to the in-lab activity including the lab presentations, lab demos and lab implementations. The students are encouraged to rotate their presence in the lab so all gain their much needed hand-on engineering experience.

The midterm is designed as a virtual take home group research design problem. All students must contribute to this assignment.

The final exam is scheduled as a regular exam but using the virtual method. Please follow the CourseLInk for more information.

6.1 Marking Schemes & Distributions

Name	Scheme A (%)
Labs	45
Midterm	15
Final Exam	40
Total	100

6.2 Assessment Details

Labs (45%)
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: 13 % (demo 6.5%, report 6.5%)

Project (Lab 4): 16% (demo 8%, report 8%)

Group Midterm Design Assignment with Report (15%)
Date: Week 7, Virtual
Learning Outcome: 1, 2, 3, 4, 5, 6, 11, 12
Midterm: This is a group midterm design assessment with report. A small design problem related to the topics presented in the first part of the course will be the topic of this midterm. The group will design the solution for a real-time embedded application problem accompanied by a 3 to 4 page report. The problem might contain research component.

Submission deadline by the end of week 7

Final Exam (40%)

Date: Thu, Dec 10, 8:30 AM - 10:30 AM, Virtual
Learning Outcome: 2, 3, 5, 6, 7, 8
Final Exam: The final exam is virtual mode. You will be required to upload your exam paper by a specified time (Check CourseLink). 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

TA Student Work Evaluation (0%)

Date: Week 12
Learning Outcome: 9, 10, 11, 12, 13
This is a questionnaire that is filled by the TA and lab instructor of the ENGG4420 course for the purpose of evaluating individual student performance during the laboratory time.

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 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 all the labs. If an overall grade of lower than 50% is obtained in any lab, the students need to arrange with the instructor and the teaching assistant to reschedule a new demo and report submission.
2. Obtain a passing grade in the final exam (50% or higher applicable to the final exam grade).
3. If the course passing conditions 1 and 2 are not met then the final course grade will be 47% (the laboratory grades will not be considered).

Contesting marks: All laboratory and midterm test marks must be contested within 2 days from the grade submission. In addition, the exams must be written in pen or ink for contest considerations.

Lab Work: You must attend and complete all laboratories. If you missed 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 will be applied. Applied

penalties will be posted on Engg*4420 CourseLink system.

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7 Course Statements

7.1 F20, Course Delivery (COVID)

COVID, Lecture Delivery:

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COVID, Laboratory Delivery

1) Face-to-Face (FTF) Laboratory Delivery. For as long as it is permissible by the University regulations, the laboratory for the course will be delivered in FTF mode. For the FTF lab delivery, we require that groups of 4 students should be formed and at least 1 and at most 2 students per group should be participating to the in-lab activity in order to meet the social distancing requirements. Also, the students will be instructed how to follow all COVID safety requirements. The other members of the group (not present in the lab) must connect using virtual technology and contribute to the lab work through virtual activity. This must be done during the lab hours, and the students are encouraged to work in virtual mode outside the lab hours in order to complete their laboratory work. I addition, the students should rotate their participation to the FTF in-lab activity, meaning that every other week if possible different members of the group should participate to the in-lab activity. This is to allow all students to gain their necessary hands-on engineering experience. If there are students that cannot attend the in-lab activity (due to justifiable reasons) they should try to join a group where they can contribute for the lab through virtual work and the other members agree to this virtual only participation.

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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 book their exams at least 7 days in advance and not later than the 40th Class Day.

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 Disclaimer

Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings and academic schedules. Any such changes will be announced via CourseLink and/or class email. All University-wide decisions will be posted on the COVID-19 website (https://news.uoguelph.ca/2019-novel-coronavirus-information/) and circulated by email.

9.10 Illness

The University will not normally require verification of illness (doctor's notes) for fall 2020 or

winter 2021 semester courses. However, requests for Academic Consideration may still require medical documentation as appropriate.
