



# ENGG\*3370 Applied Fluids and Thermodynamics

01

Winter 2020

Section(s): C01

School of Engineering

Credit Weight: 0.50

Version 1.00 - January 05, 2020

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## 1 Course Details

### 1.1 Calendar Description

This course builds on the fundamentals of fluid dynamics and thermodynamics introduced in previous courses by looking at relevant applications. Topics to be covered include: heating, ventilation and air conditioning (HVAC); heat engine systems such as the Carnot cycle for refrigeration and heat pumps and the Rankine cycle for vapour power systems; compressible flow, turbomachinery such as pumps, turbines, and propellers; and an introduction to combustion.

**Pre-Requisites:** ENGG\*2230, ENGG\*3260

**Co-Requisites:** ENGG\*3430

### 1.2 Course Description

The fundamental knowledge obtained in the introductory Thermodynamics and Fluid Mechanics courses will be utilized to study and design the applied thermofluid systems. For example, power plant, refrigerator, heat pump, gas turbine, compressor, air-conditioning system, hydraulic pump, and hydraulic turbine, internal combustion engine, and jet engine.

### 1.3 Timetable

#### Lectures

Tuesday, Thursday  
011:30am–12:50pm MCLN 102

#### Tutorials (Week 1 to Week 12)

Wednesday Sec 01 01:30PM - 03:20PM THRN 3402 & THRN 3404  
Tuesday Sec 02 08:30AM - 10:20AM THRN 3402 & THRN 3404

Wednesday Sec 03 08:30AM - 10:20AM THRN 3402 & THRN 3404  
 Wednesday Sec 04 11:30AM - 01:20PM THRN 3402 & THRN 3404  
 Friday Sec 05 08:30AM - 10:20AM THRN 3402 & THRN 3404  
 Friday Sec 06 12:30PM - 02:20PM THRN 3402 & THRN 3404

### **Laboratory (Week 1 to Week 12)**

Wednesday Sec 01 01:30PM - 03:20PM THRN 3402 & THRN 3404  
 Tuesday Sec 02 08:30AM - 10:20AM THRN 3402 & THRN 3404  
 Wednesday Sec 03 08:30AM - 10:20AM THRN 3402 & THRN 3404  
 Wednesday Sec 04 11:30AM - 01:20PM THRN 3402 & THRN 3404  
 Friday Sec 05 08:30AM - 10:20AM THRN 3402 & THRN 3404  
 Friday Sec 06 12:30PM - 02:20PM THRN 3402 & THRN 3404

## **1.4 Final Exam**

Final Exam (55%):  
 Date: Thursday, 09th April, 2020  
 Time: 7:00pm to 9:00pm  
 Location: TBA

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## **2 Instructional Support**

### **2.1 Instructional Support Team**

**Instructor:** Shohel Mahmud Ph.D., PEng  
**Email:** smahmud@uoguelph.ca  
**Telephone:** +1-519-824-4120 x54058  
**Office:** RICH 3519  
**Office Hours:** TBA on Courselink or by appointment

**Lab Technician:** Michael Speagle  
**Email:** mspeagle@uoguelph.ca  
**Telephone:** +1-519-824-4120 x56803  
**Office:** RICH 1102

### **2.2 Teaching Assistants**

**Teaching Assistant:** Mohammad Heidari  
**Email:** mheidari@uoguelph.ca

**Teaching Assistant:** Mohammadreza Mohaghegh  
**Email:** mohaghem@uoguelph.ca

**Teaching Assistant:** Kumar Venkateshwar  
**Email:** venkatek@uoguelph.ca

**Teaching Assistant:** Bassel Abdulkader

Email: babdelka@uoguelph.ca

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## 3 Learning Resources

### 3.1 Required Resources

#### Course Website (Website)

Course material, news, announcements, and grades will be regularly posted to the ENGG\*3370 Courselink site. You are responsible for checking the site regularly.

#### Thermodynamic Property Table (Other)

Y. Cengel and M. Boles

### 3.2 Recommended Resources

#### Thermodynamics: An Engineering Approach, 9th Ed. (Textbook)

Y. Cengel and M. Boles, McGraw-Hill, 2018.

#### Thermodynamics: An Engineering Approach (Textbook)

Y. Cengel and M. Boles, 8<sup>th</sup> Ed., McGraw-Hill, 2014.

#### Fluid Mechanics (Textbook)

F.M. White, 8<sup>th</sup> Ed., McGraw-Hill, 2015.

#### Refrigeration and Air Conditioning (Textbook)

C.P. Arora, 3<sup>rd</sup> Ed., McGraw-Hill, 2008.

#### ASHRAE Handbook – Fundamentals (Other)

(Chapters 17 and 21), American Society of Heating Refrigerating and Air-Conditioning Engineers, 2009.

### 3.3 Additional Resources

**Lecture Information:** A summary of the lecture notes will be posted on the courselink.

**Lab Information:** The lab manuals and lab schedule will be posted on the courselink. You are responsible for printing the lab manuals and having them with you during the laboratory sessions.

**Home Assignments:** There will be approximately 8 problem sets posted in Courselink during the term. These problem sets will not be marked, but it is recommended that you do each problem set, as practice problems are the best way to learn the course. All the solutions will be posted.

**Miscellaneous Information:** Other information related to Applied Fluids and Thermodynamics will be posted on the web page.

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## 4 Learning Outcomes

### 4.1 Course Learning Outcomes

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

1. Analyze different types of thermodynamic cycles
2. Apply thermodynamic cycles to practical devices
3. Evaluate the performance of ideal and real thermodynamic cycles
4. Differentiate between power generating and power consuming devices
5. Understand the properties of moist air and use the psychrometric chart as a tool to determine the properties of atmospheric air
6. Apply the principles of the conservation of mass and energy to various air-conditioning processes
7. Determine the cooling/heating load for rooms and buildings
8. Apply the conservation of mass to reacting systems to determine balanced reaction equations
9. Calculate the enthalpy of reaction, enthalpy of combustion, and the heating values of fuels
10. Develop the general relations for compressible flows encountered when gases flow at high speeds
11. Develop exergy balance equation and apply it for different thermofluid systems
12. Analyze different types of turbomachines and develop their performance parameters
13. Select an appropriate class of turbomachines for particular applications
14. Conduct Applied Fluids and Thermodynamic laboratory tests through collecting and analyzing data using the appropriate sensors and instruments and write clear, concise and professional laboratory reports
15. Demonstrate effective skills in teamwork during group activities; demonstrate respectful interactions with peers, lab technician, teaching assistants, and instructor, self assessment

### 4.2 Engineers Canada - Graduate Attributes (2018)

Successfully completing this course will contribute to the following:

#	Outcome	Learning Outcome
1	Knowledge Base	1, 3, 5, 9
1.4	Recall, describe and apply program-specific engineering principles and concepts	1, 3, 5, 9

#	Outcome	Learning Outcome
2	Problem Analysis	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
2.4	Execute an engineering solution	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
2.5	Critique and appraise solution approach and results	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
3	Investigation	14
3.3	Analyze and interpret experimental data	14
5	Use of Engineering Tools	14, 15
5.3	Recognize limitations of selected engineering tools	14, 15
7	Communication Skills	14, 15
7.2	Interpret technical documentation such as device specification sheets, drawings, diagrams, flowcharts, and pseudocode	14, 15
10	Ethics & Equity	14, 15
10.3	Demonstrate values consistent with good ethical practice, including equity, diversity, and inclusivity	14, 15

## 5 Teaching and Learning Activities

### 5.1 Lecture

**Topics:** Review of Thermodynamics

**Learning Outcome:** 1, 2, 3, 4

**Topics:** Vapor and combined power cycles

**Learning Outcome:** 1, 2, 3, 4

<sup>1</sup>Chapter 10

Learning Objectives 1-4

**Topics:** Refrigeration cycles and special refrigeration systems

**Learning Outcome:** 1, 2, 3, 4

<sup>1</sup>Chapter 11

Learning Objectives 1-4

**Topics:** Introduction to Turbomachinery  
**Learning Outcome:** 12  
<sup>2</sup>Chapter 11

Learning Objective 12

**Topics:** Hydraulic turbines  
**Learning Outcome:** 12, 13  
<sup>2</sup>Chapter 11

Learning Objectives 12-13

**Topics:** Hydraulic pumps  
**Learning Outcome:** 12, 13  
<sup>2</sup>Chapter 11

Learning Objectives 12-13

**Topics:** Thermodynamics of gas-vapor mixture  
**Learning Outcome:** 1, 2, 5, 6  
<sup>1</sup>Chapter 14

Learning Objectives 1-2, 5-6

**Topics:** Introduction to air-conditioning  
**Learning Outcome:** 2, 5, 6, 7  
<sup>1</sup>Chapter 14

Learning Objectives 2, 5-7

**Topics:** Introduction to combustion  
**Learning Outcome:** 8, 9  
<sup>1</sup>Chapter 15

Learning Objective 8-9

**Topics:** Gas power and propulsion cycles  
**Learning Outcome:** 1, 2, 3, 4  
<sup>1</sup>Chapter 09

Learning Objectives 1-4

**Topics:** Introduction to compressible flow  
**Learning Outcome:** 10  
<sup>1</sup>Chapter 17, <sup>2</sup>Chapter 09

Learning Objective 10

**Topics:** Exergy - A measure of work potential  
**Learning Outcome:** 4, 11  
<sup>1</sup>Chapter 08

Learning Objective 4, 11

**Topics:** Review

## 5.2 Lab

**Topics:** 1 Refrigeration and Heat Pump cycles

**Equipment:** Heat pump setup

2 Special refrigeration systems (a) thermoelectric refrigerator and (b) vortex tube coolers

**Equipment:** thermoelectric refrigerator and vortex tube cooler

3 Impulse Turbine

**Equipment:** Pelton Wheel Turbine

4 Reaction Turbine

**Equipment:** Francis Turbine

5 Rotodynamic Pump

**Equipment:** Centrifugal pump setup

6 Positive Displacement Pump

**Equipment:** Reciprocating pump setup

7 Steam power plant

**Equipment:** Mini steam power plant

8 Air-conditioning systems

**Equipment:** Complete HVAC setup

9 Window air-conditioner

Equipment: Window type air-conditioning unit

10 Heating values of a solid fuel and a liquid fuel

**Equipment:** Bomb calorimeter

11 Exergy analysis of a body losing heat

**Equipment:** Transient cooling of hot water experimental setup



## 12 Demonstration of Stirling Engine

Equipment: low  $\Delta T$  Stirling engine, medium  $\Delta T$  Stirling engine, and high  $\Delta T$  Stirling engine in Sustainable Energy Lab)

**Learning Outcome:** 14, 15

### 5.3 References

<sup>1</sup> Y. Cengel and M. Boles, Thermodynamics: An Engineering Approach, 8<sup>th</sup> Ed., McGraw-Hill, 2014.

<sup>1</sup> Y. Cengel and M. Boles, Thermodynamics: An Engineering Approach, 9<sup>th</sup> Ed., McGraw-Hill, 2018.

<sup>2</sup> F.M. White, Fluid Mechanics, 7<sup>th</sup> Ed., McGraw-Hill, 2011.

<sup>3</sup> C.P. Arora, Refrigeration and Air Conditioning, 3<sup>rd</sup> Ed., McGraw-Hill, 2008.

<sup>4</sup> ASHRAE Handbook – Fundamentals (Ch.17 & Ch.21), American Soc. Heating Refrigerating and Air-Conditioning Engineers

### 5.4 Other Important Dates

**Monday, 06th January, 2020:** Winter 2020 Semester Starts

**Tuesday, 07th January, 2020:** First lecture of Applied Fluids and Thermodynamics

**Monday, 17th February to Friday, 21st February, 2020:** Winter Break

**Friday, 3rd April, 2020:** Classes conclude

**Monday, 6th April, 2020:** Examinations commence

For other Important Dates please check the following link:

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c03/c03-wintersem.shtml>

### 5.5 Tutorial and Cooperative Learning Exercises

**Tutorial, Quiz, and Thermofluid System Demonstration: THRN 3402 and THRN 3404**

(Sustainable Energy Lab) is booked for **weekly tutorial, thermofluid system demonstration, and lab experiment**. Each tutorial and lab hour is 1 hour 50 minutes combined. Your TA will solve and discuss a maximum of 2 problems in the first half of the tutorial (approximately 50 minutes, but it may vary depending on the topic(s) covered in the lecture for a particular week – from **Week 1 to Week 7 and Week 10 to Week 12**). TA will also answer your question regarding the “Problem Set” available in the course website. You are going to solve one or two problems in the next half of the tutorial (approximately 50 minutes, but it may vary depending on the chapter covered in the lecture for a particular week – from Week 1 to Week 7 and

Week 10 to Week 12) as a part of the tutorial quiz. You need to make a group of two students (including yourself) for solving the problem in the second part of the tutorial. At the end of each tutorial you must submit your solution to your TA for marking. You are heavily encouraged to attend the tutorial regularly. **In addition** to the problem solving and tutorial, your TA and Lab Technician will **demonstrate**, time to time, different types of thermofluid systems (e.g., pumps, turbines, refrigerators, engines, and so on) during this tutorial hour.

## 5.6 Lab Experiments

**Lab Experiments:** The purpose of performing the Lab is to verify some of the theoretical learning in our class by experiments. Applied Fluids and Thermodynamics Lab is located inside the “Sustainable Energy Lab (THRN 3402 and THRN 3404)”. Lab experiments will be executed **from Week 8 to Week 9 (and may be extended to Week 10 in case if it is required)**. The class will be divided into multiple groups for conducting different experiments. Your Lab Technician and TAs will help to form the group and conduct the experiments. There will be no problem solving during these weeks. ‘Lab Manual’ and schedule will be available in the COURSE LINK. Students must submit a lab report (details on the lab report will be available in the COURSE LINK). Individual Lab Report is due one week after the last lab experiment is conducted. Please submit a hardcopy of the lab report in your regular lab/tutorial class.

## 6 Assessments

### 6.1 Marking Schemes & Distributions

Name	Scheme A (%)
Assignments	0
Cooperative Learning Exercises in Tutorial	5
Labs	15
Midterm Exam	25
Final Exam	55
Total	100

### 6.2 Assessment Details

#### Assignments (0%)

Approximately 8 Problem Sets (0% Mark Assigned)

#### Cooperative Learning Exercises in Tutorial (5%)

**Learning Outcome:** 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13

Each tutorial is divided into two parts. In the first part, your GTA will solve and discuss some problems. In the second part of your tutorial you will be asked to solve one or two problems. You need to make a group of two students (including yourself) for solving the problem in the second part of the tutorial. At the end of each tutorial you must submit your solution to your GTA for marking. A total 5% mark is allocated for such problem solving

activities. **You are heavily encouraged to attend your Registered Section of tutorial regularly.**

**Tutorial Exercise Schedule:**

Week 1- Problem Solving Activity 1

Week 2- Problem Solving Activity 2

Week 3- Problem Solving Activity 3

Week 4- Problem Solving Activity 4

Week 5- Problem Solving Activity 5

Week 6- Problem Solving Activity 6

Week 7- Problem Solving Activity 7

Week 10- Problem Solving Activity 8

Week 11- Problem Solving Activity 9

Week 12- Problem Solving Activity 10

**Labs (15%)**

**Learning Outcome:** 1, 3, 5, 9, 14

The purpose of performing the Applied Fluids and Thermodynamics Lab is to verify a portion of the theoretical learning in your lectures by conducting experiments. Applied Fluids and Thermodynamics Lab is located inside the "**Sustainable Energy Lab (THRN 3402)**". The detailed schedule will be posted on your courselink. Experiments are designed to cover most of the basic aspects of Applied Fluids and Thermodynamics. The 'Lab Manual' will be available in courselink. **A total 15% mark is allocated for performing all lab components**

**Midterm Exam (25%)**

**Learning Outcome:** 1, 2, 3, 4, 12, 13

**Midterm Exam (25%):** Midterm Exam

Date: Tuesday, 25th February, 2020

Time: 11:30AM to 12:50PM

Location: MCLN 102

### **Final Exam (55%)**

**Learning Outcome:** 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13

Final Exam (55%)

Date: Thursday, 09th April, 2020

Time: 7:00pm to 9:00pm

Location: TBA

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## **7 Course Statements**

### **7.1 Communication & Email Policy**

Please use lectures and lab help sessions as your main opportunity to ask questions about the course. Major announcements will be posted to the course website. **It is your responsibility to check the course website regularly.**

### **7.2 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 within two weeks of 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>

**Missed Midterm Exam:** If you miss your midterm due to grounds for granting academic consideration or religious accommodation, the weight of the missed midterm will be added to the final exam. **There will be no makeup midterm tests.**

**Lab Work:** **You must attend and complete all laboratories in order to pass this course.** If you miss a laboratory due to grounds for granting academic consideration or religious

accommodation, arrangements must be made with the teaching assistant to complete a makeup lab.

**Late Lab Reports:** Late submissions of lab reports will not be accepted.

**Passing Grades:** The passing grade of this course is 50% and every student must obtain a grade of 50% or higher in the Final Exam portion of the course in order for the midterm exam, laboratory write-up, and Quizzes portion of the course to count towards the final grade.

## 7.3 Relationships with other Courses & Labs

### Previous Courses:

**ENGG\*2230:** Steady and unsteady state; 1st law and Bernoulli equation; fluid flow rate and friction; laminar and turbulent flows; non-dimensional parameters (e.g., Reynolds number)

**ENGG\*2400:** Modeling of engineering systems

**MATH\*2270:** Solving differential equations

**ENGG\*3260:** System and control volume; work and heat and their interaction with the boundary and direction; energy efficiency and effectiveness of systems; thermodynamic losses;

### Follow-on Courses:

**ENGG\*3430:** Foundation for application of heat transfer in various types of systems

**ENGG\*3470:** Foundations of energy balances, thermal flow, thermal properties; Mass transfer through fluid flows (convection), thermal fluid properties

**ENGG\*3830:** Foundations of heat and mass balance and bioreactor design

**ENGG\*4230:** Foundations for design of energy conversion processes

**ENGG\*4300:** Foundations for design of food engineering process

**ENGG\*4330:** Foundation for performance analysis of combustion systems

## 7.4 Lab Safety Specific for ENGG\*3370

- You must read and follow safety rules posted on the door of the Sustainable Energy Lab (THRN3402).
- You must read the experiment manuals carefully. You will find additional safety requirement related to specific experiments in the manuals. Follow them accordingly.
- Always wear safety glasses during lab time.
- Your lab technician and teaching assistants will deliver a short lecture on lab safety during the first lab session.

# 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>

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