



# ENVS\*4440 Advanced Controlled Environment Systems

Winter 2022

Section(s): C01

School of Environmental Sciences

Credit Weight: 0.50

Version 1.00 - December 16, 2021

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## 1 Course Details

### 1.1 Calendar Description

Students will focus on the manipulation of specific environment parameters and how that manipulation affects biological growth and development or achieves a commercial/research objective. The technical skills developed will be balanced with in-depth discussions on the broader environmental and societal implications of controlled environment agriculture (e.g., food insecurity, urban agriculture, adapting to a changing climate). Weekly activities will focus on both practical and theoretical aspects of CES crop production and will be used to support student research activities.

**Pre-Requisites:** ENVS\*3300  
**Restrictions:** Instructor consent required.

### 1.2 Course Description

ENVS\*4440 - Advanced Controlled Environment Systems builds on the general concepts and plant-environment interactions introduced in ENV\*3300 (Introduction to Controlled Environment Systems). One hour lectures will drill down into many of the plant-environment interactions introduced in ENV\*3300, discuss and demonstrate the tools of the trade e.g., spectroradiometers), and expose students to career opportunities through guest speakers and student driven interviews. Labs are designed as a semester long experiment where each group (2-3) of students will run a plant production trial to determine the effects of assigned environment manipulations (e.g., light quality, light intensity, temperature, CO<sub>2</sub>, etc.) or production strategies on crop development. Students will receive training on the unique requirements of growth chamber experiment design and data analysis, and will be expected to maintain their experiments throughout the semester. Grades will be based on quizzes, lab book maintenance, an industry interview report, and a final presentation/experiment report.

### 1.3 Timetable

Timetable is subject to change. Please see WebAdvisor for the latest information.

## 1.4 Final Exam

There is no final exam.

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## 2 Instructional Support

### 2.1 Instructional Support Team

<b>Instructor:</b>	Thomas Graham PhD, PhytoGro Research Chair in Controlled Environment Systems
<b>Email:</b>	tgraham@uoguelph.ca
<b>Telephone:</b>	+1-519-824-4120 x54869
<b>Office:</b>	ECBA 2105
<b>Office Hours:</b>	By Appointment
<b>Instructor:</b>	Michael Dixon PhD, Director of the Controlled Environment Systems Research Facility
<b>Email:</b>	mdixon@uoguelph.ca
<b>Telephone:</b>	+1-519-824-4120 x52555
<b>Office:</b>	ECBL 1213
<b>Office Hours:</b>	By Appointment

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## 3 Learning Resources

### 3.1 Required Resources

#### Lab Book (Other)

Students will be required to maintain a lab book within their group. The lab book will be provided.

#### Personal Protective Equipment (Equipment)

Students will be working in a lab environment and are expected to follow PPE requirements. Students are responsible for their own:

- safety glasses
- closed toe shoes

Optional but highly recommended:

- lab coats for general activities (note: if dispensing hazardous chemicals (e.g., acids), a lab coat will be available for that activity)

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## 4 Learning Outcomes

### 4.1 Course Learning Outcomes

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

1.
    - Recognize and use pH, EC, Dissolved oxygen , PAR, leaf area meters, etc.
    - Run a spectral scan (spectroradiometer) on a lighting array
    - Design and execute a 'typical' plant production experiment within the context of growth chamber requirements & limitations
    - Statistically analyze CES production data
    - Become fluent in the basic language used in CEA
    - Maintain, at a professional level, a valid lab book
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## 5 Teaching and Learning Activities

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## 6 Assessments

### 6.1 Marking Schemes & Distributions

Quiz #1: 7.5% Week 3

Quiz #2: 7.5% Week 5

Interview Summary (presentation): 10% Week 10

Lab book maintenance 1: 5% Week 4

Lab book maintenance 2: 15% Hand in last class/lab

Engagement: 10% End of course

Peer Evaluation: 5% End of course

Final Report: 25% First week of exams

Final Presentation: 15% Final Week

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## 7 University Statements

### 7.1 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.

### 7.2 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>

### 7.3 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>

## 7.4 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.

## 7.5 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>

## 7.6 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>

## 7.7 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.

## 7.8 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>

## 7.9 Disclaimer

Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings, changes in classroom protocols, and academic schedules. Any such changes will be announced via CourseLink and/or class email.

This includes on-campus scheduling during the semester, mid-terms and final examination schedules. All University-wide decisions will be posted on the COVID-19 website (<https://news.uoguelph.ca/2019-novel-coronavirus-information/>) and circulated by email.

## 7.10 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).

## 7.11 Covid-19 Safety Protocols

For information on current safety protocols, follow these links:

- <https://news.uoguelph.ca/return-to-campuses/how-u-of-g-is-preparing-for-your-safe-return/>
- <https://news.uoguelph.ca/return-to-campuses/spaces/#ClassroomSpaces>

Please note, these guidelines may be updated as required in response to evolving University, Public Health or government directives.

