

# ERS 270 - SUSTAINABLE AGRICULTURE

## Course Outline: January 2019

*"Bring diversity back to agriculture. That's what made it work in the first place"*  
– David R. Brower

**Please read this course syllabus. It will answer many of your questions related to this course.**

### COURSE DESCRIPTION

This course provides both survey and detailed examinations of the ethics, science, and techniques involved in sustainable agriculture. Topics normally include management of crops, soil, water, nutrients, wastes and pesticides, integrated pest management, organic farming, permaculture, ecological farm planning, use of genetically modified organisms, urban agriculture in developing nations, and innovations such as computer modelling and precision farming. This course is available on D2L (Learn).



### COURSE GOAL

To introduce the fundamental concepts of sustainable agriculture and agroecology; and to introduce the major factors that lead to the interaction between people, society and agroecosystem and system-level interactions.

### INTENDED LEARNING OUTCOMES

#### 1. Agroecology

- Understanding the agroecosystem concept and why fundamental change in agriculture is needed

#### 2. Crops, Abiotic Factors of the Environment and Autoecology

- Understanding biotic and abiotic factors affecting crop production and agroecosystems and positive and negative impacts of heterotrophic organisms

#### 3. System-Level Interactions

- Understanding population ecology, genetic resources in agroecosystems & species interactions

#### 4. Transitioning to Sustainability

- How to convert to an ecologically based management system and what are the indicators of sustainability. What are sustainable food systems: integrating agriculture, society & agroecology

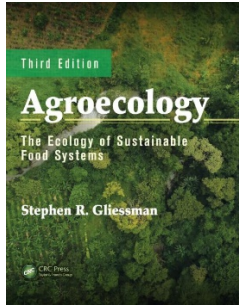
## COURSE MEETING TIMES & LOCATION

| Lecture Times              | Location |
|----------------------------|----------|
| Tuesday 8:30 am – 11:20 am | DWE 3518 |

## INSTRUCTIONAL TEAM

|                     | PROFESSOR   | TEACHING ASSISTANT |
|---------------------|---|--------------------|
| NAME                | Prof. Dr. M. Oelbermann   | Shefaza Esmail     |
| CONTACT INFORMATION | Office: EV-2, room 2008<br>E-mail: <a href="mailto:moelbermann@uwaterloo.ca">moelbermann@uwaterloo.ca</a><br>Phone: 519-888-4567 Ext. 37552 | Contact via Learn  |
| OFFICE HOURS        | TBD   | TBD                |

## COURSE MATERIALS



This textbook is available in the UW Bookstore:

Required

Stephen R. Gliessman. *Agroecology: The Ecology of Sustainable Food Systems, 3<sup>rd</sup> Ed.*, CRC Press, 2015 ISBN-10: 9781439895610 (Copy on reserve at Dana Porter)

Additional (*but not required for the course*) readings to supplement the textbook will be available on Learn. These readings will be relevant to the material discussed in class; help with the assignment and provide further insight for interested students.

## COURSE ASSESSMENT

| LEARNING OUTCOME   | ASSESSMENT METHODS (FORMATIVE & SUMMATIVE)               | % OF OVERALL GRADE | TEACHING & LEARNING METHODS  |
|--|--|--------------------|--|
| 1. Agroecology   | • Class discussions & participation                      | 5                  | • Interactive lectures<br>• Case studies   |
| 2. Crops, Abiotic Factors of the Environment and Autoecology | • Midterm in class (lectures 1 to 4)                     | 20                 | • Video presentation<br>• Textbook readings<br>• Course website<br>• PowerPoint slides |
| 3. System-Level Interactions                                 | • Group Assignment<br>• Class discussion & participation | 30<br>5            | • Interactive lectures<br>• Case studies<br>• Video presentation                       |
| 4. Transitioning to Sustainability                           | • Final exam (cumulative)                                | 40                 | • Textbook readings<br>• Course website<br>• PowerPoint slides                         |

## SUMMARIZED SCHEDULE OF COURSE ACTIVITIES

| MODULE #  | DAY OF LECTURE          | LECTURE # | TOPIC   | READING MATERIAL                       |
|---|-------------------------|-----------|---|--|
| Module 1:<br>Agroecology  | January 8, 2019         | 1         | - Introduction to ERS 270<br>- Change in agriculture<br>- Agroecology & agroecosystems                    | Introduction<br>Chapter 1<br>Chapter 2 |
|   | January 15, 2019        | 2         | - Crops<br>- Light<br>- Temperature<br><b>Video: Real Dirt on Farmer John</b>                             | Chapter 3<br>Chapter 4<br>Chapter 5    |
| Module 2:<br>Crops, Abiotic Factors of the<br>Environment & Autoecology | January 22, 2019        | 3         | - Soil<br>- Soil Water<br><b>Video: The Living Soil (Soil Health Institute)</b>                           | Chapter 8<br>Chapter 9                 |
|   | January 29, 2019        | 4         | - Humidity & Rainfall<br>- Wind<br>- Fire   | Chapter 6<br>Chapter 7<br>Chapter 10   |
|   | February 5, 2019        | 5         | - Biotic factors & organisms<br>- Environmental complexity  | Chapter 11,<br>13<br>Chapter 12        |
| Module 3:<br>System-Level Interactions                                  | February 12, 2019       |           | <b>MIDTERM (lectures 1 to 4)</b>  |  |
|   | February 18 to 22, 2019 |           | <b>READING WEEK</b>   |  |
|   | February 26, 2019       | 6         | - Population ecology<br>- Genetic resources<br>- Species interactions<br><b>Video: The Future of Food</b> | Chapter 14<br>Chapter 15<br>Chapter 16 |
|   | March 5, 2019           | 7         | - Agroecosystem diversity<br>- Animals in agroecosystems<br><b>GROUP ASSIGNMENT DUE</b>                   | Chapter 17<br>Chapter 19               |
|   | March 12, 2019          | 8         | - Agroecosystem disturbance, succession & management  | Chapter 18<br>Chapter 21               |
|   | March 19, 2019          | 9         | - Converting to ecologically based management   | Chapter 22<br>Chapter 23               |
| Module 4:<br>Transition to<br>Sustainability                            | March 26, 2019          | 10        | - Agriculture, society & agroecology<br>- Sustainable food systems  | Chapter 24<br>Chapter 26               |

# DETAILED SCHEDULE OF COURSE ACTIVITIES

## MODULE I: AGROECOLOGY

### LECTURE 1

#### Introduction to ERS 270: Sustainable Agriculture

- Course outline
- Course expectations

#### Agroecology & Agroecosystems (Chapters 1 & 2)

- The case of why a fundamental change in agriculture is needed
- What is agroecology
- What are agroecosystems; agroecosystems within the context of the food system

## MODULE 2: CROPS, ABIOTIC FACTORS OF THE ENVIRONMENT & AUTOECOLOGY

### LECTURE 2

#### Crops, Light & Temperature (Chapters 3, 4 & 5)

- Crop nutrition; crops and their interaction with the environment
- Importance of light and photosynthesis for crops; managing light in agroecosystems
- Sources of heat, variation in temperature, response of plants to temperature; microclimates; temperature & sustainability

*Video: The Real Dirt on Farmer John – The epic tale of a maverick Mid-western farmer. An outcast in his community, Farmer John bravely stands amidst a falling economy, vicious rumors, and violence. By melding the traditions of family farming with the power of art and free expression, this powerful story of transformation and renewal heralds a resurrection of farming in America (1 hr & 22 minutes).*

### LECTURE 3

#### Soil & Soil Water (Chapters 8 & 9)

- Soil formation & development; soil horizons; soil characteristics; soil nutrients; soil organic matter; soil management; sustainable soil management; diversifying cropping systems
- Movement of water in soil; water availability & plant water uptake; excess water; water deficiency; irrigation ecology; water resource use optimization

*Video (from Soil Health Institute): The Living Soil Our soils support 95 percent of all food production, and by 2060, our soils will be asked to give us as much food as we have consumed in the last 500 years. They filter our water. They are one of our most cost-effective reservoirs for sequestering carbon. They are our foundation for biodiversity. And they are vibrantly alive, teeming with 10,000 pounds of biological life in every acre. Yet in the last 150 years, we've lost half of the basic building block that makes soil productive. The societal and environmental costs of soil loss and degradation in the United States alone are now estimated to be as high as \$85 billion every single year. Like any relationship, our living soil needs our tenderness. It's time we changed everything we thought we knew about soil. Let's make this the century of living soil.*

## LECTURE 4

### Humidity, Rainfall, Wind & Fire (Chapters 6, 7 & 10)

- Precipitation & hydrology, rainfed agroecosystems; wet & dry seasons; increased precipitation variability
- Effects of wind & atmospheric movement; modifying wind in agroecosystems
- Fire in natural ecosystems; effects of fire on soil; plant adaptations to fire; fire, fire management & modern agroecosystems

## LECTURE 5

### Biology & Complexity (Chapters 11, 12 & 13)

- Organisms in the agroecosystems: allelopathy, interactions among organisms
- Organisms affecting crops: parasitism & mutualism, pollinators
- The environment as a complex of factors; interactions of environmental factors; complexity

## MODULE 3: SYSTEM LEVEL INTERACTIONS

### LECTURE 6

#### Population Ecology & Genetic Resources in Agroecosystems, Crop Communities (Chapters 14, 15 & 16)

- Principles of population ecology; ecological niche and niche theory in agriculture, population ecology and crops
- Genetic change in nature and genetic diversity; selection & domestication, transgenic modification, consequences in the use of genetic resources; preserving agrobiodiversity; genetics and sustainability
- Interference at the community level; mutual beneficial interferences in agroecosystems; species interactions for sustainability

*Video: The Future of Food -- THE FUTURE OF FOOD offers an in-depth investigation into the disturbing truth behind the unlabeled patented genetically engineered foods that have quietly filled U.S. grocery store shelves for the past decade. From the prairies of Saskatchewan Canada to the fields of Oaxaca Mexico this film gives a voice to farmers whose lives and livelihoods have been negatively impacted by this new technology. The health implications government policies and push towards globalization are all part of the reason why many people are alarmed about the introduction of genetically altered crops into our food supply. Shot on location in the U.S. Canada and Mexico. The Future of Food examines the complex web of market and political forces that are changing what we eat as huge multinational corporations seek to control the world's food system. The film also explores alternatives to large-scale industrial agriculture placing organic and sustainable agriculture as real solutions to the farm crisis today. The Future of Food reveals that there is a revolution going on in the farm fields and on the dinner tables of America a revolution that is transforming the very nature of the food we eat (1 hr & 28 minutes).*

## LECTURE 7

### Agroecosystem Diversity (Chapters 17 & 19)

- Whole-system approach to diversity; ecological diversity; agroecosystem diversity and its benefits; organism colonization and diversity; diversity, resilience & sustainability
- Role of animals in ecosystems; coevolution of livestock animals and agriculture; integrated farming systems; livestock and food system sustainability

## LECTURE 8

### Agroecosystem Disturbance, Succession & Management (Chapter 18)

- Disturbance & recovery in natural ecosystems
- Disturbance & recovery application to agroecosystem management
- Agroforestry systems
- Disturbance, recovery and sustainability

# MODULE 4: TRANSITION TO SUSTAINABILITY

## LECTURE 9

### Converting to Ecologically Based Management (Chapters 22 & 23)

- Factors & guiding principles for conversion;
- Indicators of sustainability: learning from existing sustainable systems; defining & measuring agricultural sustainability

## LECTURE 10

### Agriculture, Society & Agroecology (Chapters 24 & 26)

- Narrow view of agriculture; political economy & ecology of food systems
- Broadening the agricultural perspective
- Progress towards sustainability; attaining sustainability; challenges & opportunities

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## STUDENT CONDUCT, APPROPRIATE BEHAVIOUR & MENTAL HEALTH

*Pages 6 and onwards in this Course Syllabus*

I encourage students to study together, however each student is expected to individually fulfill the requirements of the midterm and the final exam. The assignment is a group effort. Please refer to the **Assignment Outline** on Learn for further details. It is the responsibility of each student to be aware of what constitutes responsible behaviour in class, what constitutes plagiarism, and your rights and responsibilities with respect to these issues.

### STUDENT & FACULTY RESOURCES

The Faculty of Environment has an entire webpage <https://uwaterloo.ca/environment/undergraduate-teaching-resources> dedicated to Student Resources including issues surrounding the following topics. Further detailed topics are outlined below:

- Teaching Resources
- Important Dates
- The Course Outline
- Student Privacy
- Academic Integrity
- Group Work
- Scheduling and Administration of Tests and Exams
- International Exchange Students
- Accommodation and Accessibility

## **ACCOMMODATION & ACCESSIBILITY**

Please note that if you are registered with AccessAbility Services <https://uwaterloo.ca/accessability-services/about>, please write your midterm and final exam in accessibility if this is one of the requirements you requested. The instructor has to send a certain number of midterms and final exams to AccessAbility Services several days before the midterm/final exam is written. If you write in the class-room you must let the instructor know about a week ahead of time to ensure that sufficient number of midterms/exams are available.

AccessAbility Services, located in Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term.

## **MENTAL HEALTH**

The University of Waterloo, the Faculty of Environment and our Departments/Schools consider students' well-being to be extremely important. We recognize that throughout the term students may face health challenges - physical and / or emotional. **Please note that help is available.** Mental health is a serious issue for everyone and can affect your ability to do your best work. Counselling Services <http://www.uwaterloo.ca/counselling-services> is an inclusive, non-judgmental, and confidential space for anyone to seek support. They offer confidential counselling for a variety of areas including anxiety, stress management, depression, grief, substance use, sexuality, relationship issues, and much more. If you think you are experiencing mental health issues, please see this website for guidance and support: <https://uwaterloo.ca/environment/get-mental-health-support-when-you-need-it>

## **INTELLECTUAL PROPERTY:**

Students should be aware that this course contains the intellectual property of their instructor, TA, and/or the University of Waterloo. Intellectual property includes items such as:

- Lecture content, spoken and written (and any audio/video recording thereof);
- Lecture handouts, presentations, and other materials prepared for the course (e.g., PowerPoint slides);
- Questions or solution sets from various types of assessments (e.g., assignments, quizzes, tests, final exams); and
- Work protected by copyright (e.g., any work authored by the instructor or TA or used by the instructor or TA with permission of the copyright owner).

Course materials and the intellectual property contained therein, are used to enhance a student's educational experience. However, sharing this intellectual property without the intellectual property owner's permission is a violation of intellectual property rights. For this reason, it is necessary to ask the instructor, TA and/or the University of Waterloo for permission before uploading and sharing the intellectual property of others online (e.g., to an online repository).

Permission from an instructor, TA or the University is also necessary before sharing the intellectual property of others from completed courses with students taking the same/similar courses in subsequent terms/years. In many cases, instructors might be happy to allow distribution of certain materials. However, doing so without expressed permission is considered a violation of intellectual property rights. Please alert the instructor if you become aware of intellectual property belonging to others (past or present) circulating, either through the student body or online. The intellectual property rights owner deserves to know (and may have already given their consent).

**RELIGIOUS OBSERVANCES:** Students need to inform the instructor at the beginning of term if special accommodation needs to be made for religious observances that are not otherwise accounted for in the scheduling of classes and assignments.

**GRIEVANCE:** A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. See Policy 70 - Student Petitions and Grievances, Section 4, [www.adm.uwaterloo.ca/infosec/Policies/policy70.htm](http://www.adm.uwaterloo.ca/infosec/Policies/policy70.htm). When in doubt please contact your Undergraduate Advisor for details.

**APPEALS:** A decision made or penalty imposed under Policy 70 - Student Petitions and Grievances (other than a petition) or Policy 71 – (Student Discipline) may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72 (Student Appeals) [www.adm.uwaterloo.ca/infosec/Policies/policy72.htm](http://www.adm.uwaterloo.ca/infosec/Policies/policy72.htm)

**COMMUNICATIONS WITH INSTRUCTOR AND TEACHING ASSISTANTS:** All communication with students must be through either the student's University of Waterloo email account or via Learn. If a student emails the instructor or TA from a personal account they will be requested to resend the email using their personal University of Waterloo email account.



**TURNITIN:** Text matching software (Turnitin®) may be used to screen assignments in this course. Turnitin® is used to verify that all materials and sources in assignments are documented. Students' submissions are stored on a U.S. server, and are subject to the USA PATRIOT ACT, 2001; therefore, students must be given an alternative (e.g., scaffolded assignment or annotated bibliography) if they are concerned about their privacy and/or security. Students will be due notice, in the first week of the term and/or at the time assignment details are provided, about arrangements and alternatives for the use of Turnitin® in this course.

#### **RECORDING LECTURES:**

Use of recording devices during lectures is only allowed with explicit permission of the instructor of the course. If allowed, video recordings may only include images of the instructor and not fellow classmates. Posting of videos or links to the video to any website, including but not limited to social media sites such as: facebook, twitter, etc., is strictly prohibited.

**CO-OP INTERVIEWS AND CLASS ATTENDANCE:** Co-op students are encouraged to try and choose interview time slots that result in the least amount of disruption to class schedules. When this is challenging, or not possible, a student may miss a portion of a class meeting for an interview. Instructors are asked for leniency in these situations; but, a co-op interview does not relieve the student of any requirements associated with that class meeting.

When a co-op interview conflicts with an in-class evaluation mechanism (e.g., test, quiz, presentation, critique), class attendance takes precedence and the onus is on the student to reschedule the interview. CECA provides an interview conflict procedure to manage these situations. Students will be required to provide copies of their interview schedules (they may be printed from WaterlooWorks) should there be a need to verify class absence due to co-op interviews.

## **MENTAL HEALTH**

### **Everyone struggles at some point**

From transition to university life, to changes in expectations, to relationships, there are a lot of reasons you might seek help for your mental health. 1 in 5 Canadians experience poor mental health in their lifetime. **You are not alone.**

### **Signs that something might not be quite right**

If you notice any of the following situations, consider getting some support:

- Your mood is low for more than two weeks
- You've lost focus or motivation
- You're having difficulty sleeping or your energy levels are poor
- You feel extreme loneliness
- You think about harming yourself
- You feel extreme fear about certain situations

### **Counselling Services is here to support you**

We offer a variety of confidential services at no charge to University of Waterloo students who are currently registered or are on a co-op term. Our mental health professionals are here for you and interested in helping you through whatever you are experiencing. Our regular [hours](#) are Monday to Friday 8:30 a.m. to 4:30 p.m.

### **Emergency appointments**

Emergency appointments are available during our regular hours and are provided to any student who is at **immediate risk** of self harm or harming someone else, or have recently experienced a trauma.

### **Booked appointments**

Regular booked appointments can be made and scheduling depends on the urgency of your needs. When you meet with a counsellor they will listen to your concerns and develop a plan that suits your individual situation and needs. This plan could consist of booking a series of regular appointments, readings, meditations, or practical exercises.



## Walk-in appointments

Walk-in appointments are available each **Wednesday and Thursday between 11:30 a.m. and 3:30 p.m.** These appointments are 90-minutes in length and are focused on finding you practical solutions for your most pressing concern.

## UW MATES peer counselling

Peer counselling is available on a walk-in or booked basis. [MATES](#) student volunteers are trained by Counselling Services and are available to offer confidential support to students struggling with social issues, mental health issues, and transitioning to university life.

## Coping Skills seminars

Over the last couple of years, hundreds of students have found our Coping Skills [seminars](#) valuable. Coping Skills seminars are 1-hour seminars that focus on cultivating resilience, challenging thinking, managing emotions, and changing behaviour. They are offered a variety of times per term and can be registered for on LEADS.

## Group therapy and workshops

Our [groups](#) and [workshops](#) provide you with the opportunity to learn more about topics such as: Managing anxiety and stress, regulating emotion, increasing motivation, sustaining recovery from depression, learning to meditate, and much more. Registration is online through LEADS.

More information about all of our services can be found at: <https://uwaterloo.ca/counselling-services>

## After-hours and off campus resources

If you need to speak with someone outside of our regular hours the following resources are available 24/7.

### Good2Talk

[Good2Talk](#) is a free confidential help line for post-secondary students.

1-866-925-5454

### Grand River Hospital Mental Health Emergency Care

[Grand River Hospital](#) offers 24/7 emergency care for mental health emergencies. 834 King Street West, Kitchener. 519-749-4300 x 6880.

### Here 24/7

[Here 24/7](#) is Waterloo Region's Mental Health and Crisis Services team.

1-844-437-3247

### WatSAFE app

Download the [WatSAFE](#) app to have access to a list of support contacts at all times.