

# ENVIRONMENT AND RESOURCE STUDIES 311

Fall 2016

## Introduction to Systems Thinking

**Instructor:** Dr. Dan McCarthy  
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Office: EV2-2027  
Office hours: Thursdays 10:00am-12:00pm

**Meeting Time/Location:** Mondays, 12:30-2:20pm, B2 350

<b><u>Tutorials:</u></b>	TUT 101	4:30pm-5:20pm, Mondays	HH 123
	TUT 102	4:30pm-5:20pm, Mondays	HH 124
	TUT 103	2:30pm-3:20pm, Wednesdays	HH 124
	TUT 104	2:30pm-3:20pm, Wednesdays	HH 259
	TUT 105	3:30pm-4:20pm, Wednesdays	ML 311

### **Overview:**

As human beings in an interconnected world, we face a number of complex and seemingly intractable problems including such things as climate change, food security, global poverty and pandemic diseases. Understanding how to address such problems is the first step to solving them. Ultimately we need to foster social and ecological resilience. Resilience is the ability of a linked social and ecological system to respond to stress and build the adaptive capacity of individuals and groups to respond to stress. The dynamics of social change and innovation are key to building such resilience.

This course provides an opportunity to learn and begin to apply systems-based tools in the context of a case-based study defined by the student in cooperation with the teaching-team. Students are provided with an introduction to the conceptual tools of systems thinking and resilience that help understand the dynamics of social change and social innovation. These conceptual tools will then be applied by students to develop a richer understanding of a case study of fostering social change and building adaptive capacity.

## **Course Objectives:**

- 1) Through readings and weekly discussions, this course is intended to introduce undergraduate students to:
  - (i) different approaches that have been taken to describe, analyze and intervene in complex systems, and;
  - (ii) how these can be applied to issues of resilience and sustainability of linked social and ecological systems, including development of social innovations for adaptive management responses to these issues.
- 2) Apply these tools to better understand a case study that may be related to your proposed undergraduate thesis or other work or coop related experience.

## **Course Structure:**

### **Lectures**

Lecture sessions will generally be an hour and a half to two hours long. Any of the official lecture time that is not used, the course instructor will be available to provide advice on assignments.

### **Tutorials**

The 50-minute tutorials will be used to supplement and support the lectures. Teaching Assistants will provide advice on assignment topic choice and on-going support for systems description in the tutorial sessions. Students will lead-off brief discussions on their systems descriptions and proposals to get input from their peers.

## **Resources:**

### **Course Texts:**

Meadows, Donella, H., 2008. *Thinking in Systems: A Primer*. Vermont, U.S.A.: Chelsea Green.

### **NOTES:**

- This useful text will be often supplemented by weekly readings posted to LEARN.

### **DESIRE 2 LEARN:**

**All** course communications and course materials (lecture notes, weekly readings) will be provided through LEARN. Please sign in to LEARN as soon as possible and ensure you are on the course roster and that your e-mail address is correct.

**Course schedule** and **weekly readings** will be provided through **LEARN** under “Lessons”. **Supplemental course readings** are posted under “Readings”, under weekly “Lessons”, as links or specific references are provided and students are expected to find these using the University of Waterloo’s E-Journals Collection available at:

(<http://sfx.scholarsportal.info/waterloo/az>).

Please allow at least **24 hours** for responses to e-mail inquiries from the teaching team and do not expect e-mail responses from the teaching team over the weekend.

## Course Requirements:

### **Quizzes: 20%**

- These brief quizzes, held **randomly** at the beginnings of class meetings, will test student's knowledge of the weekly readings and previous lecture material
- There will be a total of **6 quizzes** throughout the term and the **top 5 quizzes** will be counted in your final mark – therefore each quiz is worth 4% of your final mark, 5 quizzes = 20%
- **Random: please come to class every week**

### **Annotated Bibliography: 30%**

- Review at least 10 topic-relevant articles / book chapters (mostly peer-reviewed) that will inform your systems description
- No more than 10 double-spaced pages (excluding title page and references)
- **Due Date: October 14<sup>th</sup>, 2016 (submitted on LEARN by midnight)**

### **Tutorial Lead-off Discussion and Participation: 10%**

- Lead Tutorial Discussion on Systems Description – Provide a brief 5-minute lead-off presentation for discussion in a tutorial session. These discussions are intended to allow you to get feedback from fellow students on your systems description to date.
- Attendance at the tutorial sessions is mandatory and attendance will be taken. This portion of the grade will be based on your attendance record at the tutorials as well as your contribution to discussions.
- **Given that presentations will take place throughout the term, grades will be based on progress-to-date**
- **Sign-Up in First Tutorial**

### **Systems Study and Theory of Systems Change: 40%**

- Develop a systems description of the research problem to both refine your understanding of the case study and to describe how you propose to change the system to make it more resilient or sustainable. The system description is to be comprised of the following:
  - A description of the components and structure of the system
  - A description of the dynamics that underlie the system
  - Your conceptual/theoretical and personal perspective, biases, assumptions
- Develop a Theory of Systems Change – what change are you proposing is necessary and document how you think this change can be enacted
- No more than 12 double-spaced pages (excluding title page and references)
- **Due Date: November 18<sup>th</sup>, 2016 (submitted on LEARN by midnight)**

### **Late Policy:**

Late assignments will be accepted up to **one week after the due date** with a penalty of one full grade (i.e., 80% becomes 70%) except for unusual mitigating circumstances that should, of course, be communicated as soon as possible. Any requests for extension without penalty or for more than one week must be made in writing in advance of the assignment due date.

## **Course Schedule:**

**NOTE:** Please refer to **LEARN 311 site** regularly for changes to this tentative **Schedule** and for **Weekly Readings**

- Week #1 – September 12<sup>th</sup> – Introduction to the course (**No Tutorials** the first week – September 12<sup>th</sup> and 14<sup>th</sup>)  
Tutorials (September 19<sup>th</sup> and 21<sup>st</sup>): Introductory Session and Sign-up for Presentations
- Week #2 – September 19<sup>th</sup> – Introduction to Systems Thinking  
Readings: Readings posted on LEARN  
Tutorials (September 26<sup>th</sup> and 28<sup>th</sup>): Discussion about Systems Descriptions
- Week #3 – September 26<sup>th</sup> – Basics of Systems Thinking / Describing Systems  
Readings: Meadows – Meadows, Thinking in Systems, Chapter 1 and 2 and additional readings posted on LEARN  
Tutorials (October 3<sup>rd</sup> and 5<sup>th</sup>): Topic Choice for Systems Description
- Week #4 – October 3<sup>rd</sup> – Theories of Systems Change  
Readings: Meadows, Thinking in Systems, Chapters 3 and 4

Fall Reading Break – October 10<sup>th</sup> – **NO CLASS, NO TUTORIALS**

- Week #5 – October 17<sup>th</sup> – Systems Thinking, an Ecosystem Approach and Decision-Making  
Readings: Meadows, Thinking in Systems, Chapters 5 and 6  
Tutorials (October 17<sup>th</sup> and 19<sup>th</sup>): Advice on Annotated Bibliography

**ANNOTATED BIBLIOGRAPHY ASSIGNMENT DUE: October 21<sup>st</sup>, 2016**

- Week #6 – October 24<sup>th</sup> – Systems Thinking and Interdisciplinary, Environmental Research  
Readings: Meadows, Thinking in Systems, Chapter 7 and additional readings posted on LEARN  
Tutorials (October 24<sup>th</sup> and 26<sup>th</sup>): Discussion on Systems Description
- Week #7 – October 31<sup>st</sup> – Resilience Thinking  
Readings: Readings posted on LEARN  
Tutorials (October 31<sup>st</sup> and November 2<sup>nd</sup>): Student Presentations/Discussions
- Week #8 – November 7<sup>th</sup> – Critical Systems Thinking  
Readings: Readings posted on LEARN  
Tutorials (November 7<sup>th</sup> and 9<sup>th</sup>): Student Presentations/Discussions
- Week #9 – November 14<sup>th</sup> – Guest Lecture by Dr. Frances Westley – Complex Systems and Social Innovation  
Readings: Readings posted on LEARN  
Tutorials (November 14<sup>th</sup> and 16<sup>th</sup>): Student Presentations/Discussions

**SYSTEMS DESCRIPTION ASSIGNMENT DUE: November 18<sup>th</sup>, 2016**

- Week #10 – November 21<sup>st</sup> – Guest Lecture by Melanie Goodchild, PhD Candidate – Indigenous Innovation and System Change  
Readings: Readings posted on LEARN  
Tutorials (November 20<sup>th</sup>): Student Presentations/Discussions
- Week #11 – November 28<sup>th</sup> – Guest Lecture by Prof. Stephen Quilley – Big History, Systems and Limits to Growth  
Readings: Readings posted on LEARN  
Tutorials (November 28<sup>th</sup> and 30<sup>th</sup>): Tutorial Wrap-up Discussion
- Week #12 – December 5<sup>th</sup> – Synthesis Lecture and Systems Transformation  
Readings: Readings posted on LEARN

## **Academic Integrity:**

**Academic Integrity:** In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. [www.uwaterloo.ca/academicintegrity/](http://www.uwaterloo.ca/academicintegrity/). Students who are unsure what constitutes an academic offence are requested to visit the on-line tutorial at: <http://www.lib.uwaterloo.ca/ait/>

**Research Ethics:** Please also note that the University of Waterloo requires all research conducted by its students, staff, and faculty which involves humans as participants to undergo prior ethics review and clearance through the Director, Office of Human Research and Animal Care (Office). The ethics review and clearance processes are intended to ensure that projects comply with the Office's Guidelines for Research with Human Participants (Guidelines) as well as those of provincial and federal agencies, and that the safety, rights and welfare of participants are adequately protected. The Guidelines inform researchers about ethical issues and procedures which are of concern when conducting research with humans (e.g. confidentiality, risks and benefits, informed consent process, etc.).

If the development of your research proposal consists of research that involves humans as participants, the please contact the course instructor for guidance and see:

[www.research.uwaterloo.ca/ethics/human/](http://www.research.uwaterloo.ca/ethics/human/)

**Note for students with disabilities:** The Office for Persons with Disabilities (OPD), located in Needles Hall, Room 1132, 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 the OPD at the beginning of each academic term.

**Religious Observances:** Please 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. Read 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.

**Discipline:** A student is expected to know what constitutes academic integrity, to avoid committing academic offence, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offense, or who needs help in learning how to avoid offenses (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course professor, academic advisor, or the Undergraduate Associate Dean. For information on categories of offences and types of penalties, students should refer to Policy 71, Student Discipline, [www.adm.uwaterloo.ca/infosec/Policies/policy71.htm](http://www.adm.uwaterloo.ca/infosec/Policies/policy71.htm). For typical penalties, check Guidelines for Assessment of Penalties, [www.adm.uwaterloo.ca/infosec/guidelines/penaltyguidelines.htm](http://www.adm.uwaterloo.ca/infosec/guidelines/penaltyguidelines.htm)

**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). See: [www.adm.uwaterloo.ca/infosec/Policies/policy72.htm](http://www.adm.uwaterloo.ca/infosec/Policies/policy72.htm)

### **Consequences of Academic Offences:**

ENV students are strongly encouraged to review the material provided by the university's Academic Integrity office (see: <http://uwaterloo.ca/academicintegrity/Students/index.html>).

**Turnitin:**

Plagiarism detection software (Turnitin) will be used to screen assignments on this course. This is being done to verify use of all material and sources in assignments is documented. In the first lecture of the Term, details will be provided about the arrangements for the use of Turnitin. **NOTE:** Students may request an alternative to Turnitin, which is to prepare an annotated bibliography for each assignment. For advice on how to prepare an annotated bibliography, see:

<http://www.lib.sfu.ca/help/writing/annotated-bibliography>