Course Information --- CPSC431, IB440, NRES431
Spring Semester, 2020

Tu, Th 11:00 – 12:20, 2020B Natural History Building

Instructors: Dr. Lisa Ainsworth, Room 147, Edward R. Madigan Laboratory, 265-9887, email: ainswort@illinois.edu. Office Hours: by appointment

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Prerequisites: IB100, IB101, IB102, IB103, IB203, or CPSC112 or consent of instructor.

Credit: 3 HOURS credit

Course aims: Plants & Global Change (CPSC 431, IB 440, NRES 431) aims: (1) to provide an overview and synthesis of global atmospheric and climate change and its impacts on plants, including crops and natural ecosystems; (2) to give an appreciation of how atmosphere, climate and ecosystems interact, and models developed both to synthesize current understanding and predict into the future; (3) to provide a basis for considering how agriculture and other land use may be adapted to climate change, how plants and biological systems might be utilized to mitigate atmospheric change, and the environmental implications of these issues. The focus is on the processes and other biological mechanisms that provide the basis for a) understanding responses and b) development of predictions and solutions. **Learning outcomes**: Students will gain biochemical, molecular and physiological understanding of plant responses to global climate change. Students will read and evaluate primary scientific literature, develop effective communication and debate skills, work collaboratively, and critically evaluate science-related news and information from diverse information sources.

Texts: IPCC Fourth Assessment Report: Climate Change 2013
http://www.ipcc.ch/report/ar5/wg1/

ADB Leakey (2014) The Anthropocene: Plants in a New Environmental Domain. In: *The Plant Sciences*. Ed: RK Monson. Springer. DOI 10.1007/978-1-4614-7612-2_6_1

Current literature for lectures will be posted on the moodle page.

Evaluation: Midterm examination (25%)
Final examination (25%)
Debate (25%)
Quizzes (12.5%)
Discussion + Readings (12.5%)

Midterm Examination: Multiple choice, short answer and long essay test in class.

Final Examination: Take-home essay questions.

Must be done individually, without consultation from other students.

Debate: Parliamentary-style debate in class. Please see debate rules document for more information.

Reading assignments: You will answer assigned questions from the readings associated with each block of lectures, and then discuss your answers with your classmates.

Course Attendance Policy: Regular class attendance is expected of all students. Students should inform instructors in advance of missing class and generally adhere to the guidelines specified in the UIUC Student Code (http://studentcode.illinois.edu/article1_part5_1-501.html).

Disability Accommodation: To ensure that disability-related concerns are properly addressed from the beginning of the semester, students with disabilities who require assistance to participate in this class are asked to see an instructor as soon as possible.

Academic Integrity. As specified in the UIUC Student Code, "*It is the responsibility of each student to refrain from infractions of academic integrity, from conduct that may lead to suspicion of such infractions, and from conduct that aids others in such infractions*." It is our responsibility as instructors to uphold the academic integrity policy of the University (http://studentcode.illinois.edu/article1_part4_1-401.html).

Course Topics

I. Greenhouse Gases & Radiative Forcing
II. Global Carbon Cycle & Climate Change: Past, Present & Future
III. Plant Response to Rising Carbon Dioxide Concentrations
IV. Plant Response to Rising Temperature
V. Plant Response to Altered Water Availability & Salinity
VI. Plant Response to Rising Tropospheric Ozone
VII. Thresholds for Response
VIII. Solutions

Class #	**Date**	**Topic**
1	Jan 21	Class overview, greenhouse gases & radiative forcing
2	Jan 23	Global carbon cycle, past & future climate change
3	Jan 28	Effects of elevated CO_2 on photosynthesis
4	Jan 30	Elevated CO_2 effects on plant-water relations
5	Feb 4	Elevated CO_2 effects on nutrient uptake, acclimation and respiration
6	Feb 6	Elevated CO_2 effects on growth and productivity
7	**Feb 11**	**DEBATE 1**
8	Feb 13	Temperature effects on photosynthesis and respiration *Reading Assignment 1*
9	Feb 18	Temperature stress: cellular and molecular responses

10	Feb 20	Temperature effects on reproductive processes, yield and NPP
11	Feb 25	Drought effects 1 *Reading Assignment 2*
12	**Feb 27**	**DEBATE 2**
13	Mar 3	Drought effects 2
14	Mar 5	Drought sensing, tolerance and adaptation
15	Mar 10	Midterm Review
16	**Mar 12**	**MIDTERM**
	Mar 17 – Mar 19	SPRING BREAK
17	Mar 24	Chemistry and occurrence of ozone
18	**Mar 26**	**DEBATE 3** *Reading Assignment 3*
19	Mar 31	Ozone damage and ozone tolerance in plants
20	Apr 2	FACE ozone experiments: case studies
21	**Apr 7**	**DEBATE 4**
22	Apr 9	Thresholds in plant and ecosystem responses to global change *Reading Assignment 4*
23	Apr 14	Adapting agriculture to climate change
24	Apr 16	Climate change targets for biotechnology
25	**Apr 21**	**DEBATE 5**
26	Apr 23	Biological approaches to mitigating global environmental change *Reading Assignment 5*
27	Apr 28	Building better biofuel crops
28	Apr 30	The ecology of producing biofuels without causing more problems than you solve. . . *Reading Assignment 6*
29	**May 5**	**DEBATE 6**
	May 14	**FINAL EXAMS DUE**