
BIOL 411

Global Change Biology

Winter Term (2022-23)

CALENDAR DESCRIPTION

This course focusses on the fundamental biology underlying the major global change issues that humanity currently faces. Strong emphasis will be placed on the critical interconnections among issues across hierarchical levels from molecule to biosphere that explain the patterns and mechanisms which have led to our current environmental predicament.

PREREQUISITE: BIOL 300/3.0

SCHEDULE

Term: Winter

Lecture times: Tuesdays 11.30-13.00 (Humphrey 223; MacCorry D201); Fridays 13.00-14.30 (Ellis Hall 226)

Instructor	Dr. P. Grogan
Instructor Contact	groganp@queensu.ca Phone: 613-533-6152
Office Hours	To be determined
TA:	Dominic Wood
TA Contact Information	18daw@queensu.ca
Office Hours	To be determined

Learning outcomes

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

1. Explain and contrast the major global environmental issues that our civilisation faces.
2. Develop and apply an over-arching conceptual framework to identify and organize the principal interactions among the major global change issues that ramify their impacts.
3. Describe the patterns and causes of previous civilisations' rises and falls to appraise our current global environmental predicament within an historical context.
4. Summarize the impacts of western 'progress'-based, individualist, and capitalist ideologies on humanity's relationship with the rest of the nature, and contrast those with the more holistic ideologies of Indigenous and eastern cultures.
5. Use concepts such as Progress trap, Global Planetary Boundaries, The Anthropocene, Biogeochemical linkage interactions, Deep Ecology, Socio-Ecological Stewardship, and Complex Adaptive Systems to discuss, evaluate, and critique potential solutions for individual global change issues.

- Identify and analyze the fundamental biological root causes of our civilisation’s current environmental predicament, and use that assessment to develop lasting personal solutions for coping with, and constructively responding to, the major global change issues of the 21st century.

Learning Hours

Teaching method		Average hours per week	Number of weeks	Total hours
In-class hours	Lecture			
	Seminar	2	12	24
	Laboratory			
	Tutorial	1.5	12	18
	Practicum			
	Group learning	1	12	12
	Individual instruction			
Other	Online activity	2	12	24
	Off-campus activity	3	1	3
	Private study	3	12	36
Total hours on task				117

Course Outline

This advanced undergraduate level course will focus on the biology underlying the major global change issues that our civilisation currently faces (e.g. land-use change including deforestation, biodiversity loss, invasive species, climate change, nitrogen pollution, antibiotic resistance). Strong emphasis will be placed on specifically highlighting the interconnections across all hierarchical organisational levels in Biology - from molecule all the way up to biosphere. The course will specifically address the following questions: *What is our current scientific understanding of the specific biology underlying each of the major global change issues? In what ways do these biology-based insights point the way toward potential solutions, and ultimately influence perspectives on our civilisation’s future?*

Professor and student-lead seminars will introduce many of the major global change issues as well as a number of conceptual frameworks to understand them and their interactions. Specific concepts will include: Progress trap, Global Planetary Boundaries, Biogeochemical linkage interactions, The Anthropocene, Deep Ecology, Socio-Ecological Stewardship, and Complex Adaptive Systems.

The ultimate aim is to empower students so that they can develop their own perspectives on how to interpret, cope with, and constructively respond to the major global change issues that they will face through the 21st century.

Provisional topics outline:

1. Introduction – conceptual frameworks
2. Land-use change – patterns, drivers, and impacts
3. Carbon Cycle and Climate Change
4. Antibiotic Resistance and Virus epi/pandemics – rapid evolution of human pathogens
5. Nitrogen Cycle – too much of a ‘good’ thing
6. Phosphorus Cycle – humanity’s absolute need – peak phosphorus
7. Biodiversity – 6 th extinction; invasive species
8. Freshwater extraction – growing demand, limited supply
9. Ocean acidification – cause, thresholds, and biological impacts
10. Atmospheric contaminants – mercury, nitrogen,
11. Human population size – the elephant in the room
12. Anthropogenic Electromagnetic Radiation??
13. Nuclear weapons proliferation??
14. Success stories: Ozone; Acid rain; ??
15. Case study: Climate change and other recent perturbations in the Arctic
16. Historical perspective – ‘The Short History of Progress’; Progress-traps
17. Indigenous and other non-western cultural perspectives on humanity’s relationship with the rest of nature – Perspectives and Implications
18. Emerging perspectives on sustainability: Socio-Ecological Stewardship, Complex Adaptive Systems, Well-being
19. Deep Ecology and other Environmental Philosophies
20. What can Biology tell us about our Future?
21. Synthesis

Textbooks/Readings

No individual textbook is available that would cover the scope of the course’s content. Selected published papers (from international peer-reviewed science journals such as [Global Change Biology](#)) and book chapters chosen by the prof and by the students will be posted on the onQ system and referenced on the course web site (<https://www.queensu.ca/terrestrial-ecosystem-ecology/teaching/biol-411-global-change-biology>).

Grading Scheme

Component	Weight (%)	Date
Participation in tutorial discussion (based on intellectual depth and relevance of contributions, not quantity)	15	Ongoing through course
Written questions provided in advance of each seminar and designated tutorial (based on intellectual depth and originality)	20	Ongoing through course
Group seminar	25	To be determined

Outline of final synthesis exercise	10	To be determined
Final synthesis exercise	30	To be determined

2. Grading Method

As part of the Grading Scheme, the instructor will use a combination of the various Grading Method approaches outlined below to assess the different components of the course (itemized above), and will combine those grades into a final course letter grade.

a. Sample syllabus text for the “letters in, letters out” method:

All components of this course will receive letter grades which, for purposes of calculating your course average, will be translated into numerical equivalents using the Faculty of Arts and Science approved scale (see below). Your course average will then be converted to a final letter grade according to Queen’s Official Grade Conversion Scale (see below).

Arts & Science Letter Grade Input Scheme

Assignment mark	Numerical value for calculation of final mark
A+	93
A	87
A-	82
B+	78
B	75
B-	72
C+	68
C	65
C-	62
D+	58
D	55
D-	52
F48 (F+)	48
F24 (F)	24
F0 (O)	0

Queen’s Official Grade Conversion Scale

Grade	Numerical Course Average (Range)
A+	90-100
A	85-89
A-	80-84
B+	77-79
B	73-76
B-	70-72
C+	67-69
C	63-66
C-	60-62
D+	57-59
D	53-56
D-	50-52
F	49 and below

b. Sample syllabus text for the “numbers in, letters out” method:

All components of this course will receive numerical percentage marks. The final grade you receive for the course will be derived by converting your numerical course average to a letter grade according to Queen’s Official Grade Conversion Scale:

Queen’s Official Grade Conversion Scale

Grade	Numerical Course Average (Range)
A+	90-100
A	85-89
A-	80-84
B+	77-79
B	73-76
B-	70-72
C+	67-69
C	63-66
C-	60-62
D+	57-59
D	53-56
D-	50-52
F	49 and below

c. Sample syllabus text for mixed marking:

In this course, some components will be graded using numerical percentage marks. Other components will receive letter grades, which for purposes of calculating your course average will be translated into numerical equivalents using the Faculty of Arts and Science approved scale (see below). Your course average will then be converted to a final letter grade according to Queen’s Official Grade Conversion Scale (see below).

Arts & Science Letter Grade Input Scheme

Assignment mark	Numerical value for calculation of final mark
A+	93
A	87
A-	82
B+	78
B	75
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D	55
D-	52
F48 (F+)	48
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D+	57-59
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F	49 and below

Statement on Academic Integrity

The following statement on academic integrity builds on a definition approved by Senate and is designed to make students aware of the importance of the concept and the potential consequences of departing from the core values of academic integrity. It is highly recommended that this statement be included on all course syllabi. Instructors may also consider including this statement with each assignment.

Queen's students, faculty, administrators and staff all have responsibilities for supporting and upholding the fundamental values of academic integrity. Academic integrity is constituted by the five core fundamental values of honesty, trust, fairness, respect and responsibility (see www.academicintegrity.org) and by the quality of courage. These values and qualities are central to the building, nurturing and sustaining of an academic community in which all members of the community will thrive. Adherence to the values expressed through academic integrity forms a foundation for the "freedom of inquiry and exchange of ideas" essential to the intellectual life of the University.

Students are responsible for familiarizing themselves with and adhering to the regulations concerning academic integrity. General information on academic integrity is available at Integrity@Queen's University, along with Faculty or School specific information. Departures from academic integrity include, but are not limited to, plagiarism, use of unauthorized materials, facilitation, forgery and falsification. Actions which contravene the regulation on academic integrity carry sanctions that can range from a warning, to loss of grades on an assignment, to failure of a course, to requirement to withdraw from the university.

Turnitin Statement

Queen's University has partnered with the third-party application Turnitin to help maintain our standards of excellence in academic integrity. Turnitin is a suite of tools that provide instructors with information about the authenticity of submitted work and facilitates the process of grading. Submitted files are compared against an extensive database of content, and Turnitin produces a similarity report and a similarity score for each assignment. A similarity score is the percentage of a document that is similar to content held within the database. Turnitin does not determine if an instance of plagiarism has occurred. Instead, it gives instructors the information they need to determine the authenticity of work as a part of a larger process.

Copyright of Course Materials

Any written or visual material an instructor produces is automatically copyrighted, and an instructor may pursue any violator of that copyright whether or not a notice is placed on the course material. The materials presented in this course are designed for use as part of BIOL 411 at Queen's University and are the property of the instructor unless otherwise stated. Third party copyrighted materials (such as book chapters and articles) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law.

Privacy Statement for Instructors Who Use External Software in Their Course

This course may make use of Turnitin. Be aware that by logging into the site, you will be leaving onQ, and accessing [the name of company's] website and [name of software application]. Your independent use of that site, *beyond what is required for the course* (for example, purchasing the company's products), is subject to [name of company's] terms of use and privacy policy. You are encouraged to review these documents, using the link(s) below, before using the site.

Links to the most common websites used by instructors are listed below:

- Crowdmark - <https://crowdmark.com/privacy/queens/>
- Pearson & Peer Scholar- <http://www.pearsoncanada.ca/pearson-canada-at-a-glance/legal/privacy-statement>
- Wiley - <http://ca.wiley.com/WileyCDA/Section/id-302344.html>
- McGraw Hill - <https://www.mheducation.ca/privacy/>
- Turnitin - http://turnitin.com/en_us/about-us/privacy
- Rosetta Stone (formerly Tell Me More)
- http://resources.rosettastone.com/CDN/us/agreements/US_Privacy_Policy-102513.pdf
- Coglaba - <https://coglab.cengage.com/info/privacy.shtml>

Accommodations Statement

Queen's University is committed to achieving full accessibility for persons with disabilities. Part of this commitment includes arranging academic accommodations for students with disabilities to ensure they have an equitable opportunity to participate in all of their academic activities. If you are a student with a disability and think you may need accommodations, you are strongly encouraged to contact Student Wellness Services (SWS) and register as early as possible. For more information, including important deadlines, please visit the Student Wellness website at: <http://www.queensu.ca/studentwellness/accessibility-services/>

Academic Considerations for Students in Extenuating Circumstances

The Senate Policy on Academic Consideration for Students in Extenuating Circumstances (<http://www.queensu.ca/secretariat/sites/webpublish.queensu.ca.uslwww/files/files/policies/ExtenuatingCircumstancesPolicyFinal.pdf>) was approved in April, 2017. Queen's University is committed to providing academic consideration to students experiencing extenuating circumstances that are beyond their control and which have a direct and substantial impact on their ability to meet essential academic requirements. The Faculty of Arts and Science is developing a protocol to provide a consistent and equitable approach in dealing with requests for academic consideration for students facing extenuating circumstances, which will be posted on the Faculty of Arts and Science website in Fall, 2017.

Location and Timing of Final Examinations

As noted in Academic Regulation 8.2.1, “the final examination in any class offered in a term or session (including Summer Term) must be written on the campus on which it was taken, at the end of the appropriate term or session at the time scheduled by the Examinations Office.”

The exam period is listed in the key dates prior to the start of the academic year in the Faculty of Arts and Science Academic Calendar and on the Office of the University Registrar’s webpage. A detailed exam schedule for the Fall Term is posted before the Thanksgiving holiday; for the Winter Term it is posted the Friday before Reading Week, and for the Summer Term the window of dates is noted on the Arts and Science Online syllabus prior to the start of the course. Students should delay finalizing any travel plans until after the examination schedule has been posted. Exams will not be moved or deferred to accommodate employment, travel /holiday plans or flight reservations.