

ECON326 – McGill University

ECOLOGICAL (also called Biophysical) ECONOMICS
Fall 2023 Syllabus

Class Times: [REDACTED]
Room: [REDACTED]
Credits: 3

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Office Hours: TBD

Students are expected to read carefully and follow instructions below:

1) In accord with McGill University's Charter of Student Rights, students in this course have the right to submit in English or in French written work that is to be graded. This does not apply to courses in which acquiring proficiency in a language is one of the objectives. (Approved by Senate on 21 January 2009)

Conformément à la Charte des droits de l'étudiant de l'Université McGill, chaque étudiant a le droit de soumettre en français ou en anglais tout travail écrit devant être noté, sauf dans le cas des cours dont l'un des objets est la maîtrise d'une langue. (Énoncé approuvé par le Sénat le 21 janvier 2009)

2) McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures. (Approved by Senate on 29 January 2003) (See McGill's guide to academic honesty for more information.)

L'université McGill attache une haute importance à l'honnêteté académique. Il incombe par conséquent à tous les étudiants de comprendre ce que l'on entend par tricherie, plagiat et autres infractions académiques, ainsi que les conséquences que peuvent avoir de telles actions, selon le Code de conduite de l'étudiant et procédures disciplinaires. (Énoncé approuvé par le Sénat le 29 janvier 2003) (pour de plus amples renseignements, veuillez consulter le guide pour l'honnêteté académique de McGill.)

3) Lecture and associated material for this course are not to be reproduced or placed in the public domain. Each of you are permitted to use these materials for your own purposes, but you cannot allow others to use it by posting it online or giving it or selling it to others who may copy it and make it available. Instructor-generated course materials (e.g., handouts, notes, summaries, exam questions) may not be copied or distributed in any form or in any medium without explicit permission of the instructor. Note that copyright infringements can be subject to follow-up by the University under the Code of Student Conduct and Disciplinary Procedures.

4) *The University and your course instructor are committed to maintaining teaching and learning spaces that are respectful and inclusive for all. To this end, offensive or harmful language arising in course contexts may be cause for disciplinary action.*

5) *In the event of circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change. Additionally, portions of the course may be offered remotely, if conditions lead to this being necessitated.*

COURSE RATIONALE AND OBJECTIVES

Ecological (AKA **biophysical**) economics differs in intent, perspective, and analytical method from mainstream economics. **Environmental** economics, for example, focuses on **micro** level “optimization;” while the main job of **macro-economics** is understanding, maintaining, and if possible accelerating “growth” at the economy-wide level. By contrast **biophysical economics** studies economic activity in terms of not just “resources” or “markets” but also its economic consequences for the biosphere as a whole. Its main concern is not production or distribution at the micro or macro levels, but the use and flows of energy and matter on a global scale, the depletion of stocks of resources, and issues of waste and pollution.

Put simply, the ecological perspective attempts to adjudicate how much damage the ecosystems on which human economy and society depend can tolerate. To this question there is no simple response, however, and this course offers tools and a multi-disciplinary perspective to help find a partial answer. To do well in the course you must understand the forces, human and natural, acting on the globe, their trajectories over time and space, and their implications for the future.

Please Note:

(i) **Core** material is available *in lectures plus material in Modules on MyCourses. Attendance is essential.* The “slides” (updated year by year) on *MyCourses* are an outline of more technical and complex material. Serious learning requires activating your eyes, ears, hands, and brain: you need to see material on the screen, listen to it being explained, take careful notes, and think about what you heard and saw. In addition, the assignments that you write in this course will give you practice in thinking through and writing out what you have learned.

(ii) Some *basics* of ecology are important. Students can read any introductory ecology book or (better still) follow the 12 unit (10-12 minutes each) crash course that explains core concepts at: https://www.youtube.com/results?app=desktop&search_query=crash+course+ecology. **It is also fun.**

OTHER READINGS

There are sort-of textbooks available for **ecological (or biophysical) economics**. None of these are required reading for the course, but they are available from the McGill library and for purchase if students are interested in pursuing these ideas. The many readings accumulated on *MyCourses* are not mandatory. There will be a select few readings that students will need to familiarize themselves with, but this is all that is required. More details on readings will be discussed during lectures.

Each “module” in *MyCourses* is coupled to a particular class and contains the necessary items selected by the instructor to complement lectures. These modules are where students will find all readings and slides.

Other books worth perusing include:

A) Juan Martinez-Alier *Ecological Economics: Energy, Environment and Society* looks at some precursors of the thinking embodied in the subject.

c) Stanislav Shmelev *Ecological Economics: Sustainability in Practice* the most accessible of more technical recent works.

d) Blair Fix *Rethinking Economic Growth Theory From a Biophysical Perspective* requires reasonable knowledge of calculus and macro-economic theory.

e) Nicholas Georgescu-Roegen's *The Entropy Law and the Economic Process* is the most important book in the emergence of biophysical economics; the book's math and physics can be complicated and its grammar and sentence structure sometimes hard to parse. Some of Georgescu-Roegen's more comprehensible articles are made available in the last *MyCourses* module.

f) Vaclav Smil is perhaps the most learned person on the interface of energy, economy, and environment, and has written many books for various audiences. Some are short and easy to read, for example *Energy* or *Oil*, both written as *Beginner's Guides*. His most scientific is *Energy in Nature and Society* while *Cycles of Life: Civilization and the Biosphere* is his most fascinating. If you thought learning about ecology was fun, wait until you read some of these!

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Some key course concepts: *It is useful to keep a file of unfamiliar concepts so you can find them quickly and correctly.*

Biogeochemical cycles

Carrying capacity

Bioaccumulation

Ecosystem services

Limiting factors

Environmental footprint

Energy carriers, conversions, efficiencies etc.

Closed-loop versus linear-throughput systems

Entropy

Dissipative Structures

Dynamic systems thinking

Path dependent behavior.

Required Written Works & Marking System

All assignments are to be uploaded to MyCourses – email attachments to the professor or TA will not be accepted, unless there are exceptional circumstances. Please see separate word documents on Syllabus section of *MyCourses* for complete instructions for each assignment.

All late submissions will be subjected to a loss of one (1) mark per day up to a maximum of five (5) days. After this period your mark will be zero. This course is out of 100 marks and your grade is the accumulation of marks across the assignments and with course participation. Late submissions and overall participation can therefore be the fine line between getting an A or an A- or a B- or a C+.

Part of a university education is teaching you how to be a proper functioning adult in our complex and diverse societies. This course will teach you how to think through issues like an educated adult as well as how to meet deadlines such as an educated adult must. Without a document from a medical professional excusing a late submission there are NO exceptions, familiar, religious, or otherwise. Once you leave university the bank that is going to give you a loan will not care that your roommate has broken up with their partner and your home is crisis central, nor that you do not know how to work a word processor, etc. etc. They just want you to pay your bill on time, and if you don't there are penalties. I'm not a bank, but I like their logic.

1. Book Review (20%) to be submitted **Oct. 1st 11:59pm EST** **350 word max** **formatted in WORD 12 point type, 1.5 spacing.**

For a **Book Review**: there are many guides on the Internet. Look, for example, at reviews in *The London Review of Books*. More generally see <https://writingcenter.unc.edu/tips-and-tools/book-reviews/>. In all your written work, make sure you use correct syntax along with proper technical terminology. See **Section F below** at the **end of the syllabus** for the list of **permitted books** for this assignment. *Others are possible with permission of the instructor.* However, these reviews are meant to review a certain type of book: not a textbook, not a compendium of essays, but a book written by a single author which is capable of critique and reflection by you, the book reviewer. What we are asking for here is your *opinion* on a book; what are its merits, its pitfalls, and so forth.

Marking Criteria For Book Review *(5 marks max for each point)*

1. Clarity
2. Appropriateness (in terms of class themes)
3. Structure of Argument
4. Conclusion (accuracy and credibility)

2. Mid-term Exam (in-class) 20%. Oct. 12th

This short exam will test students on material presented in the first 6 weeks of class, prior to our Reading Break. Questions will be made up from assigned reading material (*not* supplementary materials) and course lectures. It will take from 45mins to 1 hour to complete.

Students are not permitted to bring any electronic devices out during the examination. This includes tablets, smart phones, and laptops. If a student is found with their phone out during the exam their mark will be zero. Any attempt to photograph or otherwise duplicate examination material could result in further disciplinary action. There is ZERO tolerance on this policy.

Any student who is absent for the mid-term will receive a grade of zero, unless documentation is provided showing a significant medical emergency. In case of alternative situations students may request a deferred exam by emailing Babcock, but this will only be considered if the request is for legitimate reasons and is received at least 2 weeks prior to the scheduled exam.

3. Case Study (40%). Submission date: Nov. 5th 11:59pm EST five page max formatted in WORD 12 point, 1.5 spacing.

Each student will prepare a **max five-page analytical text PLUS no more than two pages for references, charts, or diagrams** to discuss an environmental/ecological issue of the student's own choosing. A Case Study uses the frameworks taught in class, e.g. flows of matter and energy, cycles of life, and how throughput (low entropy to high entropy transformations) manifests itself in the time and space, to examine a particular entity (such as a mine or LNG facility) in the world. It boils down to a clear picture of the costs of human engineered energy and material flows into **and out of the economy of nature.**

Your analysis should be systemically driven with careful regard for both long and short term, proximal and distal from the point of impact of the problem under review. Consider your topic from several distinct angles – economic, political, sociological, and certainly ecological – to produce a well-rounded viewpoint. A specific subject could be a metallic ore, a type of plant, a particular species of insect facing new problems because of human exploitation, direct or indirect, and so forth. The world is wide open for Case Study choices: animal, vegetable, mineral, exploring the resulting impact by *human interventions* in and on the natural world as well as blow-back effects. In other words, consider scale and scalability of both the problem and its consequences. Pay attention to habitat (natural or synthetic), material stocks, energy flows, toxin production, waste accumulation, that affect not simply energy and material at a **given** stage of production but well beyond.

One warning: Every year several students write standard form essays which read much more like political commentary – that is NOT what I want as you can see from the Case Study examples on MyCourses. This is a *DATA DRIVEN* analysis of the form that will likely be unfamiliar to some students. There will be one class dedicated to case studies where I will offer a tutorial and answer any questions. If you want a good grade you should attend this lecture.

Marking Criteria for the Case Study (10 marks max each)

1. Systematic analysis with multiple spatial and temporal perspectives
2. Correct use of core course concepts
3. Quality, clarity, and depth of exposition
4. References and data sources

4. Class Participation (5%) and reflection on Unit 5: Four Pathways to Future (15%)
Submission date: Dec. 3rd 11:59pm EST 500 word max formatted in WORD 12 point, 1.5 spacing.

Participation in the final four lectures is essential for the final assignment. Here central ideas and themes will be explored and expanded upon *in lecture* which will give students the necessary concepts and language to write the final assignment. The participation mark comes from engaging with material on *MyCourses* throughout the semester, as well as attendance at lectures.

This assignment consists of 500-word reflection essay asking for the students input/opinion regarding material covered throughout the course and into the future given our current social, economic, and environmental situation. This is like an exam in that I will give you material in lecture that you will then need to reproduce in your own words and provide a reflection on this material.

Marking Criteria for Reflection (5 marks max each)

1. Demonstrated knowledge of core course themes/concepts
2. Developed position on which of the four pathways you deem applicable/possible to the future
3. Creativity and originality

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Brief List of Potential Books for Review. Other options must be cleared with Babcock at least two weeks before submission. Please approach Babcock after a class or send email for approval.

Janine Benyus *Biomimicry: Innovation Inspired by Nature*

Vernon Carter & Tom Vale *Topsoil and Civilization*

William Catton *Overshoot: the Ecological Basis of Revolutionary Change*

Alfred Crosby *Ecological Imperialism: the Biological Expansion of Europe 900-1900*

Herman Daly & John Cobb *For The Common Good*

Richard Grove *Green Imperialism*

Jacob Hamblin *Arming Mother Nature: The Birth of Catastrophic Environmentalism*

Donald Hughes *Ecology in Ancient Civilizations*

Tim Jackson *Prosperity Without Growth*

Nancy Langston *Forest Dreams, Forest Nightmares*

Timothy Lecain *Mass Destruction: men and giant mines wired America and scarred the planet*

Mark Levinson *The Box: How the Shipping Container Made the World Smaller*

J.R. McNeill *Something New Under the Sun: An Environmental History of the Twentieth-Century World*

William McNeill *Plagues and Peoples*

Andreas Malm *Fossil Capital: the Rise of Steam Power and the Roots of Global Warming*

Paul Mantoux *The Industrial Revolution in the Eighteenth Century*

Gerland Markowitz & David Rosner *Deceit and Denial: Deadly Politics of Industrial Pollution*

Alan Moorehead *The Fatal Impact*

John Perlin *A Forest Journey: the Story of Wood and Civilization*

Steven Pyne *Vestal Fire: An Environmental History Told Through Fire*

Oliver Rackham *History of the Countryside*

Callum Roberts *The Unnatural History of the Sea*

Edmund Russell *War and Nature*

Marshall Sahlins *Stone Age Economics*

Richard Tainter *The Collapse of Complex Societies*

Richard Tucker *Insatiable Appetite: the United States and the Ecological Degradation of the Tropical World*

Nicholas Wade *Before the Dawn*

Donavan Webster *Aftermath: the Remnants of War*

Alan Weisman *The World Without Us*

Donald Worster *Rivers of Empire: Water, Aridity, and the Growth of the American West*

Terry Hunt and Carl Lipo *The Statues that Walked*

List still in Progress. Whichever you pick be prepared to question what you read and use your imagination. All of the above books have something important to say about the themes of the course, but that does not mean they are always right.