

University of Waterloo, Department of Economics

Econ 655 Resource Economics

Winter 2022

Course Outline

(updated: November 25, 2021)

Professor: Horatiu Rus

Contact Information:

Class time and location: Fridays 8:30am-11:20 am, online on Webex (synchronous)

Office hours: Tuesdays 9:30-11:30pm (or by appointment) in HH 203

Email: `hrus at uwaterloo dot ca`

Twitter: @horatiurus (#econ655)

Course materials available on UW-LEARN. Users can login to LEARN via: <http://learn.uwaterloo.ca/>

Course Description:

This graduate level course examines the economics of renewable and non-renewable natural resource exploitation. We will study theories and empirical applications to common problems in mining, forestry, fisheries, resource-based trade and sustainable development. Many natural resource economics problems are dynamic in nature, they are characterized by externalities-driven market failures and economic rents are often present. This makes for an interesting environment in which to study the optimality of resource management and appropriate government policies. In addition to aiming to understand the logic and intuition behind the various theories of natural resource management, the course also reviews some important mathematical techniques like dynamic optimization, useful for the study of natural resource problems.

The list of topics and readings below is tentative and allows for some flexibility according to the interests of the graduate students enrolled in the course.

Evaluation:

Problem sets (25%), a midterm exam (25%), a class presentation of a journal article (20%) and a final exam OR a final research proposal (30%) will make up your grade for the course. Consistent class participation is expected.

The problem sets include questions based on the material presented in the lectures or readings. These assignments are meant to deepen your understanding of the issues and can be explored individually, in pairs or very small teams. If you work in groups, you must still submit individually drafted versions of the assignment.

Each student will present one academic paper on natural resources from the reading list. Please choose your paper early in the term and discuss your choice with the instructor. Empirical papers are preferred for student presentations, which will be scheduled after the midterm.

Exams will be based on the material covered in class and will consist of several short-answer questions. The midterm exam is tentatively scheduled for the week of February 28. The final exam (if chosen) will be scheduled by the Registrar's office.

The final paper proposal topic (if chosen) needs to be approved by the instructor by the end of the reading week. The research proposal should be about 20 pages long and should describe, in detail the following: the research question, why it is important, if/why the existing literature is lacking and the plan to address this lack. The proposal will include a full literature review of the topic, as well as work and preliminary conclusions on the model (if theoretical) or on data, empirical specification and preliminary results (if empirical).

READINGS:

A combination of textbook chapters and journal articles will be read and discussed throughout the term. It is important that all of the reading assigned for the week is done prior to class. Note that indicated titles have been placed on [RESERVE] at the library, while others are available [ONLINE], typically also thorough the UW library.

A textbook recommended for the course is:

[RESERVE] *Natural Resource and Environmental Economics* by Perman, Ma, Common, Madison and McGilvray. (“Perman”)

This textbook also comes with a *very* useful companion website, where you will find all of the book’s Appendices (with the mathematical derivation of the results) and more: <http://personal.strath.ac.uk/r.perman/menu.htm>

Additional books - optional resources for specific topics and mathematical techniques:

Natural Resource Economics

[ONLINE, Google Books, full text] C. W. Clark (1989) *Mathematical Bioeconomics: The Optimal Management of Renewable Resources* (2nd edition), New York, Wiley

[ONLINE, Scholar’s Portal] J. M. Conrad (1999), *Resource Economics*, Cambridge, Cambridge University Press

[RESERVE] J. M. Conrad, and C. W. Clark, (1987), *Natural Resource Economics: Notes and Problems*, Cambridge, Cambridge University Press

[RESERVE] Conrad and Rondeau (2020), *Natural resource economics : analysis, theory, and applications*, Cambridge, Cambridge University Press

Optimal Control and Dynamic Programming

[RESERVE] M.I. Kamien and N.L. Schwartz, (1983) *Dynamic Optimization: The Calculus of Variation and Optimal Control in Economics and Management*, New York, North Holland

D. Lonard and Ngo Van Long, *Optimal Control Theory and Static Optimization in Economics*, Cambridge, Cambridge University Press, 1992

S/P. Sethi and G.L Thompson, (1981) *Optimal Control Theory: Applications to Management Science*, Boston, Martinus Nijhoff Publishing

Writing and Presenting in Economics

W. Thomson, (2001) *A Guide for the Young Economist: Writing and Speaking Effectively about Economics*, The MIT Press

General LIST OF TOPICS:

Important note: Several sources are provided for each topic, but not all readings are mandatory. I will make clear every week which readings are required and which are simply recommended.

Students are expected to read the book chapters and additional readings *indicated* for every section in the Readings sections on UW-LEARN. Please complete the readings for the week prior to class. Lectures generally include a discussion component, where your participation is critical.

The list of topics below is general and tentative. Changes to the order and/or content of some of the last topics is likely, depending on class interest.

Topic 1: Introduction: The Economic Approach to the Use of Natural Resources

Topic 2: Optimal Control Theory

Topic 3: Exhaustible (non-renewable) Resources

Topic 4: Renewable Resources

Topic 5: International Trade and Renewable Resources: Theory and Policy

Topic 6: Forest Resources

Topic 7: The Economics of Water

Topic 8: Resource Exploitation under Uncertainty

Topic 9: Sustainability. Valuing and Accounting for the Environment

Topic 10 - Choice A : Political Economy and the Exploitation of Natural Resources

Topic 10 - Choice B - Topic 10: Antibiotic Resistance, Invasive Species

(NOTE: The updated list of readings will be posted on UW-Learn.)

IMPORTANT NOTES: please read carefully!**COURSE POLICIES****University Regulations:**Academic Integrity:

Academic Integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo are expected to promote honesty, trust, fairness, respect and responsibility. Discipline: A student is expected to know what constitutes academic integrity, to avoid committing academic offences, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (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. When misconduct has been found to have occurred, disciplinary penalties will be imposed under Policy 71 ? Student Discipline. For information on categories of offenses and types of penalties, students should refer to Policy 71 - Student Discipline, <http://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71>.

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, <http://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-70>. In addition, consult <http://arts.uwaterloo.ca/student-grievances-faculty-arts-processes> for the Faculty of Arts? grievance processes.

Appeals: A student may appeal the finding and/or penalty in a decision made under Policy 70 - Student Petitions and Grievances (other than regarding a petition) or Policy 71 - Student Discipline if a ground for an appeal can be established. Read Policy 72 - Student Appeals, <http://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-72>. Academic Integrity website (Arts): [http : //arts.uwaterloo.ca/arts/ugrad/academic_espons](http://arts.uwaterloo.ca/arts/ugrad/academic_espons). Academic Integrity Office (uWaterloo): [http : //uwaterloo.ca/academic - integrity/](http://uwaterloo.ca/academic-integrity/) Accommodation for Students with Disabilities:

Note for students with disabilities: The AccessAbility Services (AS) Office, 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 AS Office at the beginning of each academic term.

Turnitin.com: Text matching software (Turnitin) will be used to screen assignments in this course. This is being done to verify that use of all material and sources in assignments is documented. Students will be given an option if they do not want to have their assignment screened by Turnitin. In the first week of the term, details will be provided about arrangements and alternatives for the use of Turnitin in this course.

Electronic Device Policy Please keep your video on during remote synchronous lectures but be on mute until you want to ask a question.

Student Notice of Recording Activities

You will receive notification of recording via at least one of the following mechanisms: within the Learning Management System (LEARN) or a message from your course instructor. Images, audio, text/chat messaging that have been recorded may be used and/or made available by the University to PS 624 for the purpose of delivery of class lectures. Recordings will be managed according to the University records classification scheme, WatClass, and will be securely destroyed when no longer needed by the University. Your personal information is protected in accordance with the Freedom of Information and Protection of Privacy Act, as well as University policies and guidelines and may be subject to disclosure where required by law. The University will use reasonable means to protect the security and confidentiality of the recorded information, but cannot provide a guarantee of such due to factors beyond the University?s control, such as recordings being forwarded, copied, intercepted, circulated, disclosed, or stored without the University?s knowledge or

permission, or the introduction of malware into computer system which could potentially damage or disrupt the computer, networks, and security settings.

The University is not responsible for connectivity/technical difficulties or loss of data associated with your hardware, software or Internet connection. By engaging in course activities that involve recording, you are consenting to the use of your appearance, image, text/chat messaging, and voice and/or likeness in the manner and under the conditions specified herein. (In the case of a live stream event, if you choose not to have your image or audio recorded, you may disable the audio and video functionality (see: Student privacy during live events). Instructions to participate using a pseudonym instead of your real name are included where the feature exists; however, you must disclose the pseudonym to your instructor in advance in order to facilitate class participation.) If you choose not to be recorded, this notice serves as confirmation of your understanding that you may follow course lectures through uploaded lectures. You are not permitted to disclose the link to/URL of an event or an event session recording or copies of recording to anyone, for any reason. Recordings are available only to authorized individuals who have been directly provided the above instructions/link for their use. Recordings for personal use, required to facilitate your learning and preparation of personal course/lecture notes, should not be shared with others without the permission of the instructor or event coordinator.