

Syllabus / ENV 215

Trees, Forests, and Sustainability

FALL 2021

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Class meets twice a week:

Tuesday 14:10 - 15:25 lecture

Thursday 14:10 - 15:25 seminar

Online course tools and materials: The course will be conducted online using the Zoom program. Additional tools such as Webex, Whatsapp, Skype or Google Docs can be used. Course materials will be available in the e-course system. Depending on the evolving health situation related to covid-19, a hybrid format (offline and online) will be implemented.

Course Description

In certain ancient civilizations, trees were believed to possess magical powers and were worshipped. For example, while trees were sacred to the Celts, the ancient Greeks associated the oak with Zeus, the king of the gods. People used the curative properties of their leaves and bark. Yet, times have changed and although trees have been around us since the dawn of time, one has to admit that people no longer seem to pay them the attention they deserve.

As far as we know, modern humans (*Homo sapiens*) appeared on Earth about 300,000 years ago, whereas trees have existed for at least 370 million years! Trees' longevity and their ability to thrive in every continent (except Antarctica) and colonize the farthest corners of the world suggest that they are highly intelligent beings. Which raises a question: shouldn't we take inspiration from trees for inventing models of development that are sustainable?

In the first part of this class, I will suggest that you put aside—for a brief moment—pure rationality in order to better immerse yourself into mythological traditions and ancient lore. This will enable you to approach the world of trees with a new sensitivity while rediscovering the common sense of past peoples. From then on, we will survey some surprising scientific findings about the growth of trees, their electrical polarity, and the way they communicate. In addition, chronobiology, a subfield of biology that studies the biological rhythms of living organisms, will help us to understand how trees act as a link

between mankind, the Earth, and the Cosmos, while repositioning Man within a universe that is more orderly than what we perceive.

This interdisciplinary course is designed to provide a modest introduction to the world of trees based on the latest scientific findings. We will go from one surprise to the next, using along the way a combination of mathematics, astronomy, biology, environmental and climate sciences (all in reasonable amounts!) mixed with a large dose of wonder. Several experiments on plants and trees will be conducted in class, and we will also make educational excursions into the EcoPark in Bishkek. With more than 41 hectares of forest protected by the AUCA and the French-Kyrgyz Association of Ecotourism (AFKE), the EcoPark is the ideal place to learn more about trees...and ourselves.

There are no prerequisites for this class. Relevant scientific concepts will be explained as needed. One of the goals is to invite students to see trees in a different light by drawing on insights from a variety of disciplines. This course will be especially useful to those who plan to work in the fields of forestry, agroforestry, climate sciences, sustainability, and more generally environmental studies.

Students who successfully complete this course will receive a certificate of participation in a project certified COP21.

Course objective:

By revisiting the traditions of ancient peoples and providing scientific explanations, the aim of this course is to encourage students to take a different look at nature and to marvel at the often-unsuspected particularities of trees and to show that, in certain aspects, the tree is a model of sustainability from which man should draw further inspiration.. Trees and forests are nowadays threatened although they are among our best allies in solving the ongoing climate catastrophe.

Learning outcomes:

Knowledge and understanding

For a passing grade the student must be able to acquire:

- Definitions of trees and forests;
- Fundamentals of tree structures and growth;
- An awareness that trees and forests communicate by different ways and description of the modes of tree communication;
- An understanding of modern geoclimatic and hydrological models giving back a primordial role to large forest massifs;
- An awareness that the rhythms of the trees unfold in synchronicity with the movements or positions of the Moon in relation to other celestial bodies;
- An understanding that trees and forests can help us limit climate change;

Competences and skills:

For a passing grade the student must be able to:

- Establish simple links between different disciplines such as mathematics, biology, astronomy, chemistry and physics to describe certain phenomena specific to the functioning of trees;
- Propose experiments to demonstrate communication between plants using electrical signals;
- Explain some of the characteristics of trees using scientific reasoning.
- Describe on chronobiology, polarity and spirality phenomenon's;

Judgment and approach:

For a passing grade the student must be able to:

- Take a critical look at strategies for the protection of trees and forests in order to combat climate change;

Methodology: The course is presented as a series of lectures and discussion sections. At the end of each lecture the questions will be discussed and several additional topics for independent study during the seminars will be offered to students.

Evaluation and Assessment: The grade for this course will be based on student's participation during the lectures, including the familiarity with the reading material, the quality of the regular assignments, and the performance in the oral and written exams.

Examination: The students will take two exams: the first one is a mid-term test and the second one is an essay-type examination or an individual oral examination. The test consists of questions on short definitions and multiple-choice questions. Exam papers are composed of essay type questions, which require in-depth answers on the topics studied. Individual oral examination consists of both short questions and questions requiring developed answers on the topics studied. Students are not allowed to use books, papers etc. during the exam. Exam questions are compiled from the questions discussed during the lectures. Evidence of using additional sources of information related to the course content will be marked in the form of additional points for examination.

Grading scheme: All grades will be awarded in accordance with the scheme given below. *Your points for the class work cannot exceed the maximum of 40.*

Assignment Points

Mid-term test and final examination	20 and 30, total 50 (maximum)
1 oral presentation, 1 home (research paper) and 1 class assignment (Multiple-choice questions)	10 (maximum for each), total 30
Active participation	10
Bonus for attending classes	10

Penalty for poor attendance:

Minus 5 for each failure to attend without legitimate excuses

A 100-95	B- 76-71	D+ 47-42
A- 94-89	C+ 70-60	D 41-36
B+ 88-83	C 59-54	D- 35-30
B 82-77	C- 53-48	F < 30

Work and Attendance: Students are expected to attend all lectures and seminars. Written assignments must be submitted to the instructor by the deadline. If a student submits an assignment late (at the latest by 5 pm the day following the deadline), 1 point will be deducted from the final grade for the work (e.g., if your grade is « A » for the work, after deduction, your grade will be « B »). Mobile devices or portable computers should only be used in class for learning purposes and with the professor's permission. If a student who is late marked absent by the instructor, he is considered to be absent for the class, unless excused by the instructor.

Documentation of reasons for absence: Any valid reasons for absence should be reported to the Instructor as soon as possible. Legitimate excuses are the following: illness, confirmed by a doctor's note next class; a death in the family; participation in conferences or seminars with preliminary notification to the Instructor and submission of the relevant supporting documents.

General Course Outline

- 1 Course Introduction, Multiple-choice Questions and General Thoughts on Trees
- 2 Remarkable, sacred trees and peoples of the tree
- 3-4 Structures and Birth
- 5-6 Polarity and Spirality
- 7 Midterm Review and Midterm Exam
- 8-9 Chronobiology
- 9-10 Wood: Traditions and Realities
- 10-11 Communication of Trees and Forests
- 11-12 The Forest, its Sustainable Management and its Functions
- 12-13 Agroforestry systems
- 14-15 Future Scenarios, Research Presentations, Final Examination

References material for reading

1. Peter Wohlleben. *The Hidden Life of Trees: What they feel, How they communicate – Discovery from a Secret World* (2017).
2. Ernst zürcher. *Les arbres entre visible et invisible* (Trees between visible and invisible) (2016)
3. Andrews Hiron, Peter A. Thomas. *Applied Tree Biology* (2018)

Several articles or research papers will be given to read and study from one class to another.

Syllabus change: The syllabus is tentative and may be modified as needed. Any change will be announced in class.