



*American University
of Central Asia*

**Environmental Sustainability and
Climate Science (ESCS)**

Bachelor of Science

Student Handbook

2022-2023

Welcome to the Environmental Sustainability and Climate Science (ESCS) specialization

Program location:

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American University of Central Asia

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The ESCS Program Coordinator and Staff members offices are located in room 415.

The core work is done on the campus but the ESCS professors organize throughout the year outdoor practices, activities and courses particularly in the Bishkek EcoPark: 41 hectares of urban forest protected and developed in an ecological way by the American University of Central Asia and the French Kyrgyz Association of Ecotourism.

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Why at AUCA?

The American University of Central Asia's Environmental Sustainability and Climate Science faculty members are award-winning researchers and teachers who encourage students to become involved in basic inquiry and critical thinking, cross-disciplinary cooperation, and the application of concepts to real-life problems so that they develop the environmental problem-solving skills required for the most dynamic areas of today's job market.

While a number of environmental initiatives exist on AUCA’s current campus, more are being developed on the new campus and in the Bishkek EcoPark: eco-friendly roofs, a solar power installation, biking initiatives, beekeeping, composting and a groundbreaking geothermal heating and cooling system that will reduce energy needs by an estimated 87%.

The EcoPark Project

EcoPark, Bishkek city, Kyrgyzstan: The Eco Park is a joint project of the French-Kyrgyz Ecotourism Association (Association Franco-Kirghize d’Ecotourisme or AFKE), the American University of Central Asia (AUCA) and the Town Hall of Bishkek and aimed at the rehabilitation of 41,1 hectares of the Elm Grove of Bishkek. The Elm Grove of Bishkek is a unique, biggest and oldest urban forest in Central Asia. It was planted back in 1881 by the horticulturist Alexei Fetisov and the first students of the Agrarian Institute and became the biggest urban green area in Central Asia. Its contribution to the air purification of the city is outstanding as it serves as a biotic pump developing a microclimate in Bishkek. Due to illegal cutting, settlements, grazing and car circulation in the grove since the access of Kyrgyzstan to independence in 1991, the area of the grove has significantly decreased from the original 215 hectares to current 123 hectares. In order to prevent the total destruction of the grove and create conditions for its regeneration as urban forest, AFKE and AUCA initiated the “Eco Park” civic engagement project. In 2015 this initiative received a label from the French Ministry of the Environment as a project of the UN Conference against the climate change (COP21). The area is protected 24 hours on 24 hours by the staff and workers of the French Kyrgyz Association of Ecotourism and our students can participate or develop environmental project there. Several activities and classes are organized there during the year.



Photos of the EcoPark in different seasons

For further information about this project feel free to contact our Program Director Philippe Boizeau (boizeau_p@auca.kg).

Mission

The creation of the Environmental Sustainability and Climate Science program was prompted by Central Asia's need for environmental experts and AUCA's mission to support the region's transition to a development path that balances social, economic and environmental interests. This program perfectly fits the university's mission of training enlightened and impassioned leaders, who think globally and act this out locally in the specific conditions of Central Asia.

The aim is to train responsible managers who master the tools of sustainable development and who also have a thorough understanding of environmental issues such as climate change, disappearing glaciers, water scarcity, and reductions in the predictability of rain and crops, and the loss of wildlife. This program focuses on developing country issues, and applicable to environmental studies worldwide, and draws on natural resource institutes such as USA and developed country universities and other leading global organizations' unrivalled pool of expertise in issues of sustainable development, climate and other environmental change, environmental management, environmental data collection and analysis.

Goals

Goal 1: To prepare communicative and responsible citizens of the world who are able to work in their chosen field of activity, possess universal competencies contributing to their social mobility and sustainability in the labor market, who are willing to work in a team and adapt to different working conditions for the benefit of environmental objectives.

Goal 2: To train practitioners in environmental management who have the technical and scientific concepts and tools related to the operational management of sustainable development.

Goal 3: Training of environmental experts capable of supporting the Central Asian region's transition to a development path that balances social, economic and environmental interests.

Learning outcomes

Learning outcome 1: To possess communication skills in foreign languages at the level of business communication that allows working with international projects;

Learning outcome 2: To be able to apply theoretical and practical knowledge to solve environmental problems;

Learning outcome 3: To apply the necessary modern IT technologies to solve problems in practice;

Learning outcome 4: To conduct research, collect and interpret data, and draw conclusions;

Learning outcome 5: To be able to work effectively individually, as a member of a team on interdisciplinary topics, as well as to lead a team.

Beliefs about learning

Learning is a continuous, life-long process of self-discovery, knowledge development, evaluation, and growth. It is individualistic and proceeds in a simple to complex manner from the level of development, interests, and motivations of the learner. The teaching learning process is reciprocal and interactive with faculty and students sharing the cooperative enterprise of learning, inquiry, teaching, and evaluation. The learner is an active participant who assumes responsibility for his/her own learning, and independent learning is fostered by encouragement and support of the learner's self-directed inquiry. The role of the faculty is to support critical thinking, facilitate the learning process, and provide and foster opportunities for life-long learning.

Admission rules:

GPA: A cumulative GPA of 2.5 or higher (on a 4-point scale) is required for admission.

Graduation Information

In order to graduate from AUCA, a student must:

- earn at least 240 credits (including credit hours earned for program internships)

- complete all General Education requirements
- complete all requirements for at least one major
- earn no more than 102 credits of introductory (100-level) courses
- pass all state graduation examinations
- successfully complete and defend a senior thesis/project.

Graduation Examinations

A student who has successfully completed all General Education and degree requirements may take the final state exams. In order to graduate, the students are required to:

pass the History of Kyrgyzstan State Exam (taken at the end of each semester);

successfully complete and defend of Senior Thesis/Project; and,

earn passing scores on two or more final state exams as required by their major(s) and minor (if applicable).

State Exam grades are included in the transcript. The evaluation and grading criteria for the final State Attestation (state exams, qualification papers, and thesis) are defined by the Program Coordinator, approved by the AUCA Academic Senate and made available to students planning to graduate.

Details about taking attestation exams are made available to students at least four months in advance. The final State Attestation is conducted in accordance with the Academic Calendar.

Degree Distinctions

The criteria for a Kyrgyz State Bachelor's diploma with honors are as follows. Students who excel in their academic program (achieving "A", "A-" grades for 75% or more of their courses and grades of "B+", "B", "B-" grades in the remaining courses) and pass all State Exams with "A" and "A-" grades receive a Kyrgyz State Diploma with Honors.

ESCS check List 2022

Order of study for 2022 admits

Academic Orientation Program [2 credits]			
1st semester (30 credits)		2nd semester (30 credits)	
First Year Seminar I	4	First Year Seminar II	4
English Composition	6	English composition	6
Intro to Philosophy I	2	Intro to Philosophy II	2
Applied Ecology: Interactions, Relationships and Conservation	6	Humanities	6
General Chemistry	6	Environmental Chemistry	6
Elective	6	Intro to Contemporary Math I	6
Sport (100 hour)	0	Sport (100 hour)	0
3rd semester (33 credits)		4th semester (33 credits)	
Kyrgyz Language and Literature I	4	Arts/SYS	6
Social Science/SYS	6	Kyrgyz Language and Literature II	4
Manas Studies	2	History of Kyrgyzstan	4
Climate Change and SDGs	6	Geography of Kyrgyzstan	2
GIS Application in Environmental Management	6	Russian Language I	2
Intro to Probability and Statistics	6	Programming R: Software for Statistical Computing	6
Elective Courses	3	Intro to Environmental Management System	6

Sport (100 hour)	0	Internship/ Research Project I (Summer)	3
		Sport (100 hour)	0
5th semester (33 credits)		6th semester (33 credits)	
Agro-Ecology Integrated Crop Management	6	Research Methods	6
Trees, Forests and Sustainability	6	Russian Language II	2
Internship/ Research Project II	6	International Environmental Law and Policy	6
Elective Courses	15	Elective Courses	19
7th semester (33 credits)		8th semester (33 credits)	
Senior Thesis Seminar-1	6	Senior Thesis Seminar-2 (6 cr.)	6
Water Resource System Planning and Management	6	The Environmental and Socio-Economic Impacts of Mining	6
Environmental Health and Safety	6	Ecosystem Services	6
Green Spaces in Urban Development	6	Climate Change and Natural Disasters	6
Elective Courses	9	Elective courses outside of student's concentration	9

Major Requirements

Fall Semester 1

1. First Year Seminar I (4 cr.)
2. English Composition (6 cr.)
3. Intro to Philosophy I (2 cr.)
4. Applied Ecology: Interactions, Relationships and Conservation (ENV/NTR-205) (6 cr.)
5. General Chemistry (EMSD/NTR-101) (6 cr.)
6. Elective (6 cr.)
7. Sport (100 hour) (0 cr.)

30 cr.

Spring Semester 2

1. First Year Seminar II (4 cr.)
2. English Composition (6 cr.)
3. Intro to Philosophy II (2 cr.)
4. Humanities (6 cr.)
5. Environmental Chemistry (ENV-110) (6 cr.)
6. Intro to Contemporary Mathematics 1 (MAT- 130) (6 cr.)
7. Sport – (0 cr.)

30 cr.

Fall Semester 3

1. Kyrgyz Language and Literature I (4 cr.)
2. Social Science/SYS (6 cr.)
3. Manas Studies (2 cr.)
4. Climate Change and SDGs (6 cr.)
5. GIS Application in Environmental Management (ENV-201) (6 cr.)
6. Intro to Probability and Statistics (Math-133) (6 cr.)
7. Elective Courses (3 cr.)
8. Sport (100 hour) (0 cr.)

33 cr.

Spring Semester 4

1. Arts (SYS) (6 cr.)
2. Kyrgyz Language and Literature II (4 cr.)
3. History of Kyrgyzstan (4 cr.)
4. Geography of Kyrgyzstan (2 cr.)
5. Russian Language I (2 cr.)
6. Programming R: Software for Statistical Computing (COM-211) (6 cr.)
7. Intro to Environmental Management System (ENV-202) (6 cr.)
8. Internship/ Research Project I (ENV-204) (3 cr.)
9. Sport (100 hour) (6 cr.)

33cr.

Fall Semester 5

1. Trees, Forests and Sustainability (ENV-215) (6 cr.)
2. Agro-Ecology Integrated Crop Management (ENV-303) (6cr.)

3. Internship/ Research Project II (ENV-300) (3 cr.)

4. Elective (15 cr.)

33 cr.

Spring Semester 6

1. Research Methods (ENV-207) (6 cr.)

2. Russian Language II (2 cr.)

3. International Environmental Law and Policy (ENV/NTR/LAS/BUS-205) (6 cr.) *

4. Elective (19 cr.)

33 cr.

Fall Semester 7

1. Senior Thesis Seminar-1 (ENV-400) (6 cr.)

2. Water Resource System Planning and Management (ENV-304) (6 cr.)

3. Environmental Health and Safety (ENV-205) (6 cr.)

4. Green Spaces in Urban Development (ENV/NTR-210) (6 cr.)

3. Elective (9 cr.)

33 cr.

Spring Semester 8

1. Senior Thesis Seminar-2 (LAS) (6 cr.)

2. The Environmental and Socio-Economic Impacts of Mining (ENV/AGEO-301) (6 cr.)

3. Ecosystem Services (ENV-301) (6 cr.)

4. Climate Change and Natural Disasters (ENV-306) (6 cr.)

5. Elective courses outside of student's concentration (9 cr.)

33 cr.

Minor Requirements

Approved by the ESCS department in November 16, 2022

MINOR POLICY IN ENVIRONMENTAL SUSTAINABILITY AND CLIMATE SCIENCE

The minor in Asia's Environmental Sustainability and Climate Science (ESCS) is specifically designed for AUCA students that are not majoring in ESCS and who are willing to gain more knowledge about this relatively new field of specialty. Students will be able to take various courses within the ambits of an innovative four-year degree program that introduces students to the increasingly important and fascinating field of ESCS by employing a multi-disciplinary approach. Students shall complete a total of 42 credits for the minor in ESCS, which includes five core courses and four elective courses.

It should be noted that students are eligible to apply/proceed with a Minor in ESCS only if they receive "B-" or higher grade for a core course (Intro to Environmental Management and Sustainable Development).

To receive a minor in ESCS students must have permission of their department chair and the coordinator of the ESCS Program Concentration. Students must have a GPA of 2.70 or higher and a "B-" grade or above in all courses that will count towards the minor.

Only successful candidates, whose transcripts will meet all the requirements of the program, will be granted a minor in ESCS.

To obtain a permission of the Coordinator of ESCS Program Concentration for the minor in ESCS, students shall submit the following documents:

- Application letter requesting consideration for a minor;
- Copy of current transcript (GPA shall be of 2.7 or higher).

MINOR REQUIREMENTS 2022

- 1. Two courses of the basic level (100) for 12 credits**
- 2. Three courses of 2nd-level (200) for 18 credits**
- 3. Two courses of the 3rd-level (300) for 12 credits**

Total : 42 credits

1. Basic level courses (12 credits)

Choose one course from the following:

Environmental Chemistry (ECh-100) (6 credits)

or

Intro to Environmental Management and Sustainable Development (ENV-100) (6 credits)

Choose one course from the following:

Applied Ecology: Interactions, Relationships, and Conservation (ENV/NTR-205) (6 credits)

or

Ecotourism and Environmental Conservation (ENV-102) (6 credits)

2. Second level courses (18 credits)

Choose three courses from the following:

Environmental and Social Impact Assessment (ENV-200) (6 credits)

Wildlife Conservation (ENV/LAS/NTR-213) (6 credits)

Green Spaces in Urban Development (ENV/NTR-210) (6 credits)

Trees, Forests and Sustainability (ENV-215) (6 cr.)

3. Third and fourth level courses (12 credits)

Choose two courses from the following:

Environmental and Socio-Economic Impacts of Mining (ENV-301) (6 credits)

Water Resource System Planning and Management (ENV-304) (6 credits)

International Environmental Law and Policy (ENV/NTR/LAS/BUS - 305) (6 credits)

Climate Change and Natural Disasters (ENV-306) (6 credits)

I updated Minor requirements from 2016 to 2022 (above)

I don't know should we include Minor requirement for previous years

Minor requirements for Environmental Management and Sustainable Development for 2017-2018-2019

- 1. Two courses of the basic level (100) for 12credits*
- 2. Three courses of 2nd-level (200) for 18 credits*
- 3. Two courses of the 3rd-level (300) for 12 credits*

Total: 42 credits

1. Basic level courses (12 credits)

- **Choose one course from the following:**

Environmental Chemistry (ECh-100) (6 credits)

or

Intro to Environmental Management and Sustainable Development (ENV-100) (6 credits)

- **Choose one course from the following:**

Applied Ecology: Interactions, Relationships, and Conservation (ENV/NTR-205) (6 credits)

or

Ecotourism and Environmental Conservation (ENV-102) (6 credits)

2. Second level courses (18 credits)

- **Choose three courses from the following:**

Environmental and Social Impact Assessment (ENV-200) (6 credits)

Wildlife Conservation (ENV/LAS/NTR-213) (6 credits)

Resources and Environmental Economics (ECO-203/203.1) (6 credits)

3. Third and fourth level courses (12 credits)

- **Choose two courses from the following:**

Environmental and Socio-Economic Impacts of Mining (ENV-301) (6 credits)

Integrated Water Resources Management (307) (6 credits)

Green Spaces in Urban Development (ENV/NTR-210) (6 credits)

Courses description:

ESCS Department courses description

100 Level

1. Environmental Chemistry
2. General Chemistry
3. Eco-tourism and Environmental Conservation

4. Intro to Environmental Management and Sustainable Development
5. Green Chemistry
6. Sustainable Ecosystem Development

200 Level

7. Introduction to Environmental Management System
8. Applied Ecology: Interactions, Relationships, and Conservation
9. Research Methods
10. Climate Change and Sustainable Development Goals
11. GIS Applications in Environmental Management
12. Environmental Geophysics
13. Programming R: Software for Statistical Computing
14. Trees, Forests, and Sustainability
15. Environmental Health and Safety
16. Social Entrepreneurship
17. Wildlife Conservation
18. Waste Management: Waste Disposal and Recycling
19. Food Security, Nutrition and Sustainable Development
20. Green Spaces in Urban Development
21. Environmental and Social Impact Assessment

300 Level

22. International Environmental Law and Policy
23. Water Resource System Planning and Management
24. Internship I
Internship II
25. Ecosystem services
26. Climate Change and Natural Disasters
27. Agro-ecology Integrated Crop Management
28. Environmental & Socio-Economic Impacts of Mining
29. Environmental Accounting and Management

400 Level

30. Senior Thesis Seminar

100 Level

1. Environmental Chemistry

In this course students will use the fundamental principles of chemistry to gain an understanding of the source, fate, and reactivity of compounds in natural and polluted environments. Emphasis will be placed on the environmental implications of energy utilization and on the chemistry of the atmosphere, hydrosphere, and lithosphere. Environmental issues that will be discussed include climate change, air pollution, stratospheric ozone depletion, pollution and treatment of water sources, and the utilization of insecticides and herbicides. *Course Goals:* The overall goal of this course is to gain an understanding of the fundamental chemical processes that are central to a range of important environmental problems and to utilize this knowledge in making critical evaluations of these problems.

2. General Chemistry

General Chemistry is a standards-based university preparatory lab science course. It fulfills one semester of the science required at AUCA. Chemistry in the community is a major attempt to enhance science literacy through university curriculum that emphasizes the impact of chemistry on society. Each unit centers on chemistry-related technological issues now confronting our world.

3. Eco-tourism and Environmental Conservation

After outlining the definitions and basic principles of ecotourism, we will see how, under certain conditions, ecotourism can generate income while contributing to the protection of the environment.

Part of the course will be devoted to the creation of surveys and the use of statistical tools for addressing environmental problems.

The knowledge acquired during the first classes will then be put into practice. Students will have the chance to participate in the reintroduction of an endangered or rare species in Kyrgyzstan. This reintroduction will be done in Bishkek in Elm Grove Park. Indeed, the park and its forest are targeted for protection by the French Kyrgyz Ecotourism Association (AFKE) in partnership with the American University of Central Asia (AUCA). This project was certified COP21 on the occasion of the 21st Conference of the Parties of the United Nations Framework Convention on Climate Change in 2015. In this context, the AFKE responded to a call for projects, which enabled the Elm Grove Forest Project in Bishkek to become a beneficiary of the PARIS2015 / COP21 label. This involved for the AFKE the signature of a charter materializing the institutional support of the COP21 Ministerial Steering Committee.

This course provides a solid understanding of ecotourism and statistics applied to the environment. In addition, students will be able to apply what they have learned by participating in the Elm Grove Forest Project and help prevent the disappearance of the largest forest in Bishkek.

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

4. Intro to Environmental Management and Sustainable Development

This course is an introduction to ecological, economic, political, and sociocultural perspectives on relationships between humans and the rest of the natural world. Environmental Management is concerned not only with the impact of humankind on the planet but also with the patterns of human behavior necessary to preserve and manage the environment in a self-sustaining way. Study is linked to the areas of new thinking in environmental management, environmental economics and the quest for alternative technologies. It provides students an interdisciplinary survey of the broad range of contemporary environmental issues and concepts. In the course, students will examine options for developing more sustainable communities and lifestyles in the face of local and global change.

5. Green Chemistry

Green Chemistry is a relatively new emerging field that strives to work at the molecular level to achieve sustainability. The field has received widespread interest in the past decade due to its ability to harness chemical innovation to meet environmental and economic goals simultaneously. Green Chemistry focuses on the design, manufacture, and use of chemicals and chemical processes that have little or no pollution potential or environmental risk and are both economically and technologically feasible. The principles of green chemistry can be applied to all areas of chemistry including synthesis, catalysis, reaction conditions, separations, analysis, and monitoring.

Green Chemistry has a framework of a cohesive set of Twelve Principles, which have been systematically surveyed in this course. The material included in the content of the discipline gives a clear idea of the foundations of this fairly new field of chemical knowledge in its current state. Special attention is paid to the universal role of the concepts of "green" chemistry in the individual development of various chemical industries and the formation of a single chemical educational space, which forms the basis for the fundamental training of specialists who are competitive in the modern labor market. In addition, it is supposed to show the great importance of "green chemistry" for the development of not only chemistry, but also other natural sciences: biology, ecology, geology, etc., as well as the social sphere.

6. Sustainable Ecosystem Development

Cities are currently the predominant human habitat. The city is not only a place of concentration of culture, comfort, service industry, but also pollution of all environments of human life. Urban landscapes are rapidly expanding globally and over 50% of the human population now lives in urban areas. Because the majority of human settlements are in areas of high biodiversity, the rapid urbanization has profound effects on biodiversity as a whole.

Urban ecology is the study of the processes, systems and relations between living organisms that take place within an urban environment. There is a need to shift from the traditional practice

of ecology as a study of stability and certainty in natural ecosystems to exploring dynamic, complex ecosystems demanding adaptability and resilience which include concept of Urban Ecosystems.

The course includes lecture topics as well as practice works that deal with the problems of interaction between cities and environment. The issues of ecology of the air, water, soil environment, ecology of flora and fauna in the conditions of urban ecosystems are briefly and deeply stated.

7. Introduction to Environmental Management System

The history of Environmental Management System, Environmental Management System as a basis for preventive action: the contents of the Standard EN ISO 14001 and EMAS. The introduction and implementation of ISO 14001. Principle of Environmental Management System of ISO14001. Development and setting of environmental policy, environmental management system planning, implementation and operation, checking, management review including management audit etc. Environmental legislation relevant for Environmental Management System. Certification; examples from companies and organizations. Other management systems, e.g., Energy management system. Literature seminars are aimed at a critical analysis of Environmental Management System. Instruction consists of lectures, seminars and exercises.\

8. Applied Ecology: Interactions, Relationships, and Conservation

Ecology and the environment are hot topics in today's world. All across the world top brands market themselves as "fair trade", governments develop new "sustainability policies", and people go "organic" in an effort to reduce their carbon footprint. But what does all this have to do with our actual environment? This course will provide you with a foundational understanding of ecology: the interactions that govern our environment. We'll learn about living and nonliving aspects of the environment, discover the relationships between organisms, explore local environments around Bishkek, investigate conservation methods and techniques available for ecological research, and uncover practical ways we can have a positive impact on our environment. Are you ready to get your feet wet, your hands dirty, and your interest in nature peaked?

9. Research Methods

This course provides a comprehensive introduction to research proposal writing, research methodologies, and foundational research theories and protocols. Students in the course learn about the cyclical nature of applied research and the iterative process of research writing. The course teaches students how to write a proposal, engage in independent studies. The curriculum is sequential, helping students to identify a study topic, formulate inquiry questions, organize a literature review, and select appropriate research designs and methodologies. Students use the

proposal they develop to establish the foundation of a summer project and the basis of a final research paper that will be submitted at the end of the summer once the study is completed. By the end of the course, students will complete a proposal that includes an introduction, problem statement (significance of study), literature review, methods section, references, and a project timeline. At the end of the summer students will convert this proposal into a full research that will include the following sections: findings, discussion, conclusions, and references.

The course enrolls students majoring in the social sciences (environmental management, social impact assessment), natural and physical sciences, engineering, and professional fields. Throughout the course, students will learn how research projects can emanate from specific intellectual interests, recognized knowledge gaps in existing scholarship, or from personal experiences or community-related matters that have broad societal implications. In summary, the course helps ESCS departments' undergraduate students become novice researchers, and it encourages them to continue looking for opportunities after the spring semester to further develop their research skills. This course, which is modeled after a graduate-level introductory research methods seminar series, prepares undergraduates for future research experiences, particularly at the graduate-level. Accordingly, students will also receive advising related to and opportunities to explore postgraduate programs.

10. Climate Change and Sustainable Development Goals. new course

Climate change is a difficult, contentious, and important issue. It will perhaps be the defining environmental issue of the 21st century. This course aims to address the whole complexity of climate change as an issue, by bringing together the science, impacts, economics, abatement technologies, and policy solutions into one course. Through this course, we will address several important questions. What is the scientific basis for our understanding of climate change, and in what ways is that scientific basis uncertain? What changes in climate might we expect over the coming centuries? What would be the impacts of these changes in climate for human well-being and the natural world? What are the sources of emissions of greenhouse gases? What technologies exist or might be developed to allow us to slow climate change, and what international policy solutions might be necessary or preferred?

Sustainable Development (SD) is defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland Report 1987). The main objective of the course is to analyze the concept of sustainable development goals in theory and practice specifically focusing on the interactions between the public domain, business world and the world we live in. Past and present strategies for promoting sustainable development, resistance to the concept, and some alternative conceptions and theoretical underpinnings of the notion of sustainable development will set the basis of discussions while the implications of the concept in politics of various sectors such as energy, transport, environment, agriculture and natural resource management will be explored. More specific sustainable development goals (SDGs) have been formulated by the UN in 2015. The most critical resources for the survival of future generations are climate stability and biodiversity. Therefore, we have to respect the planetary boundaries of economic activity today.

11. GIS Applications in Environmental Management

This course introduces the underlying principles and methods of Geographical Information Systems (GIS). It examines the processes involved in the capture, storage, manipulation, analysis, presentation and output of digital geographical data in a GIS and provides opportunities for the development of practical skills in processing data using a leading Open Source GIS software package, Quantum GIS. The course comprises a series of presentations and computer-based practical sessions using Quantum GIS software. Students will also learn how to collect and source data in addition to some use of example data sets taken from a variety of fields. The main elements of the Quantum user interface are introduced and topics covered include: data management, data visualisation, georeferencing, analysis, data presentation and reporting. GIS is a powerful data visualization and analysis tool. This undergraduate-level seminar investigates how GIS is currently being used to better understand and address environmental problems, as well as manage and protect natural resources. Overall GIS topics include: air pollution, climate change, biodiversity conservation, forest management, cultural heritage protection, soils management and agriculture, natural hazards, water resources, environmental challenges in the urban environment, and alternative energy production. Students will learn and be practicing some of the above-mentioned topics in a computer lab.

12. Environmental Geophysics

The course gives an introduction of the fundamental principles of each major branch of geophysics: seismology, gravitation, magnetism, electrical and thermal properties. Emphasis is given to geodynamics and plate tectonics. A comprehensive overview of geophysical techniques is also given to better understand the relation between measurements taken at the Earth's surface and physical properties investigated in relation to the Earth's interior. The course is designed for advanced undergraduate students with basic grounding in math and physics. Sets of practical exercises will be completed after midterm and will be designed to give students a practical approach to geophysical methods while enhancing their skills in quantitative problem solving. This course covers all major components of geophysical techniques, applications quantitative research including construction of survey instruments, administration of the process, data processing, basic quantitative analysis and reporting of results.

13. Programming R: Software for Statistical Computing

This course is an introduction to R, a powerful and flexible statistical language and environment that also provides more flexible graphics capabilities than other popular statistical packages. The course will introduce students to the basics of using R for statistical programming, computation, graphics, and modeling. We will start with a basic introduction to the R language, reading and writing data, and graphics. We then discuss writing functions in R and tips on programming in R.

Finally, the latter part of the course will focus on using R to fit some important types of statistical models, including linear regression. Our goal is to get students up and running with

R such that they can use R in their research and are in a good position to expand their knowledge of R on their own.

14. Trees, Forests, and Sustainability

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.

15. Environmental Health and Safety

Environment, health, and safety or EHS is an acronym for the set that studies and implements the practical aspects of protecting and maintaining health and safety of the environment. This course aims to study about what we must do to make sure that our activities do not cause harm to anyone. Our society need to make organized efforts for identifying potential danger and hazards to reduce negative impact and avoid accidents, harmful situations, and substances. The environmentally friendly solutions as example of studying air pollution causes, smog during the winter times, and other problems affecting the society, now actual in Central Asian countries, require a systematic approach to complying with environmental regulations, such as managing renewable energy use stimulations technologies. Today, after many considerable research and development efforts, renewable resources are now regarded as capable of supplying a significant proportion of energy in the long-term future. Thus, in this course, we will also study renewable energy sources and its applicability and feasibility in Central Asian Countries. In addition, recent years have seen the growth in importance of environmental issues, which in turn are influencing the energy scene and environment health and safety tools. This course will also explore the technologies of transportation air pollution problems and its challenges, with introducing modern solutions to be implemented in the society. It will examine the causes of smog during winter times and the technologies of heating systems, for example in Kyrgyzstan. We will also study the new technologies for heat generators for heating systems, basic fluid mechanics, heat transfer, radiators and heating surfaces, heating systems. The course will focus on modern technologies in the energy-smart houses and buildings and provide knowledge and understanding of strategies and multi-faceted approaches in critical energy enhancements and that energy efficiency that will bring about environmental health and safety.

16. Social Entrepreneurship

This course will help students understand how to create societal impact through Social Entrepreneurship. Social Entrepreneurship describes the problem discovery and sustainable utilization of opportunities to create social change. Real market examples of Social Enterprises will guide students through the process of developing a venture to address social or environmental problems. Students will be equipped with frameworks identifying opportunities, team research, and outlining their ideas. Students will develop their idea and iterate on the business model throughout the course, and conclude with completing and presenting a business plan.

17. Wildlife Conservation

Charismatic megafauna like the panda bear, elephants, or snow leopards generally “make the news” the most when talking about wildlife conservation, but what about the smaller, less well known species that are also in need of conservation? This course will allow you to understand key topics and modern principles of wildlife conservation.

Key topics of this course in this rapidly developing field include: creating accurate population counts, data collection methods, computer modeling and statistical analysis, the consequences of climate change, and evolutionary responses to disturbance.

Come along as we learn how to protect more than just the charismatic megafauna, but instead learn how we can implement conservation techniques that benefit all wildlife.

18. Waste Management: Waste Disposal and Recycling

Due to unplanned developmental activities as well as an ever-increasing population, which has caused enormous strain on the environmental resources, societies across the world face several problems of environmental degradation. However, it is imperative to maintain a balance between the capacity of the environment and the quantum of sustainable utilization. This is only possible by understanding the environment in its totality and the principles of its scientific management.

This course will explore the principles, problems, and fundamentals on Waste Management Disposal and Recycling from a sustainable development and social stability perspective. It will provide an overview examination of waste management including collection, recycling, transfer, and transport, and disposal. Methods of processing, basic disposal facilities, disposal options, and the environmental issues of waste management within the local and regional context will be covered in this course. We will discuss aspects of recycling, solid waste processing, volume reduction, encompassing typical recyclable materials (paper, plastics, cans, and organics), construction and demolition debris, electronics, and more. The course will also refer to some international practices and local initiatives on techniques, technologies, and programs that address environmental and sustainable issues on waste management.

19. Food Security, Nutrition and Sustainable Development

Food security and nutrition are essential dimensions of sustainable development. Inadequate food security and nutrition take an enormous damage on economies and have negative consequences for the livelihoods and economic potential of vulnerable populations. A world where all enjoy freedom from want, and progressively realize their right to adequate food and nutrition can only be realized through far reaching transformations, supported by policies and programmers promoting sustainable development in all its three dimensions. Strong interdependencies exist between food security, nutrition, and many other parts of a broad sustainable development agenda – inclusive economic growth, population dynamics, decent employment, social protection, energy, water, health, sanitation, natural resource management and protecting ecosystems. The empowerment of women, and addressing inequalities – notably gender inequity and rural-urban inequalities – are as critical to food security and nutrition as they are to a universal sustainable development. The empowerment of families, especially women who are the main childcare providers and are responsible for the food preparation and infant and young child feeding is also critical for these goals.

This course examines food security and nutrition in the perspective of sustainable development and social stability, taking into account the role of financial markets, agri-business industries and international food, land, and commodity trading, while connecting these factors to broader global challenges such as food sovereignty, public health, climate change, complex

emergencies, and forced migration. In addition, this course addresses population growth and the challenges it poses – in particular, the challenge of providing everyone with an adequate diet while simultaneously conserving the natural resources on which agriculture and other economic activities depend. Since human numbers are increasing more rapidly in poor countries than anywhere else, special attention is paid to population growth and the prospects for environmentally sound agricultural development in Africa, Asia, and Latin America.

20. Green Spaces in Urban Development

In 2018, the Earth has nearly 4.2 billion city dwellers and according to the latest demographic projections of the UN, 2.5 billion more will live in cities by 2050. This significant increase in the urban population raises many issues regarding the use of space and the living conditions of citizens, particularly in terms of environmental conservation. In this context, the easiest « solution » is often to destroy green spaces or to reduce their area in order to make room for housing, shops and roads. But what are the consequences on the living environment, the health and the social life of people living in cities? Shouldn't we protect and foster nature in urban areas? If so, shouldn't we favor long-term – that is, sustainable – solutions that incorporate green spaces into urban development strategies? Would it not be better to rely on these green spaces to develop a green economy in cities?

This course will first define urban green spaces in a broad sense before looking at a variety of relevant concepts such as urban tree, green and blue corridors. We will survey the latest research on trees and examine several examples of green zones in the world in order to provide answers to various questions previously asked. The main focus of the course will be the project of protection and renaturation of the Karagachevaya Rosha Park in Bishkek, implemented by the French-Kyrgyz Association of Ecotourism in partnership with the AUCA.

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

21. Environmental and Social Impact Assessment

Environmental impact assessment is a planning process that aims to predict, evaluate and mitigate the impact on the environment of a proposed project, program or policy prior to its commencement, and to approve only environmentally acceptable undertakings. EIA is hence a mechanism for avoiding or mediating some of the potential costs of development. The purpose of this course is to help students develop a comprehensive and critical understanding of the theory and practice of EIA in the world including Central Asia countries. The course examines EIA in general and in specific jurisdictions. It also examines the technical and policy issues involved in the production and the appraisal of environmental impact assessments. Using a broad definition of “environment”, various components of EIA are addressed, with an emphasis on principles, legal and institutional frameworks, stages in the process, and specific analytical techniques. Additionally, the course will focus on the ecology of human societies and the social

impact of development on communities and regions. The ecology of human societies is about connections between ecological and human social, cultural, and organizational processes. It is a very broad and general subject that crosses numerous scientific disciplines. Together, readings and lectures will provide you with a "big picture" of what human ecology and social impact are about from an interdisciplinary point of view. This learning process will help us generate a new appreciation for the complex world in which we live.

300 Level

22. International Environmental Law and Policy

Introduction Environmental regulation has expanded from a domestic phenomenon to one that has both global participants and global impacts. In this course, students will get a survey of environmental issues in international law and policy. In addition to discussing the current state of international environmental law, students will also spend time addressing how that state of affairs came to be, what stakeholders are involved, and what other policy options exist for handling these concerns. The last part of the semester will address international law in other fields that impact the environment, as well as a few issues on which international cooperation has not yet emerged.

23. Water Resource System Planning and Management

The course of Integrated Water Resource System Planning and Management includes study of key principles and issues of water resources management, considers the process of strategy development, relevant approaches to make decisions in the sphere of water resources management with the aim of providing complex approaches to use natural resources and achieving sustainable development. Resources and data of the course adapt easily to include to other existing courses, for instance, introduction to natural resource management, environmental management etc. The resources and data of the course can be used for giving lectures and also for instructors in the Institute of Education Development as well as training enterprise's managers on water resources management. The objective of the course is to introduce students with methodology and practicing part of integrated water resources management and increase an awareness of effective water use, to educate new generation managers who possess managers' skills in the sphere of rational use and conservation of water resources.

24. Internship I, II

An internship experience provides the student with an opportunity to explore career interests while applying knowledge and skills learned in the classroom in a work setting. The experience also helps students gain a clearer sense of what they still need to learn and provides an opportunity to build professional networks.

The internship will provide students with the opportunity to:

- Acquire knowledge of the industry in which the internship is done.
- Apply knowledge and skills learned in the classroom in a work setting.
- Develop a greater understanding about career options while more clearly defining personal career goals.
- Develop and refine oral and written communication skills.
- Identify areas for future knowledge and skill development.

25. Ecosystem services

Ecosystems provide a variety of valuable services that improve human well-being. The Millennium Ecosystem Assessment defines four major categories of ecosystem services: provisioning services (e.g., food, fiber, fuels, and freshwater); regulating services (e.g., climate regulation, water purification, pollination, and pest suppression); cultural services (e.g., recreation, education, aesthetics, and inspiration); and supporting services (e.g., soil formation, nutrient cycling, and primary production). This course is an in-depth, interdisciplinary exploration of ecosystem services that addresses six key questions:

1. What are ecosystem services?
2. What are ecological production functions and how are ecosystem services derived from them?
3. What methods are used to value ecosystem services?
4. What policy instruments and social institutions are used to protect ecosystem services?
5. What are the natural and human drivers of change in the provision of ecosystem services?
6. What challenges exist in defining, measuring, valuing, and protecting ecosystem services?

There are three major sections to this course. The first section introduces the concept of ecosystem services and examines the framework and key results of the Millennium Ecosystem Assessment. This foundational section sets up the framework that we will use to answer the five questions above. The second section provides more details on the methodological aspects of ecosystem services including ecological underpinnings, economic valuation, property rights, social norms, and regulation. In this section, students will gain a better understanding of methods and approaches used to measure, value, and protect ecosystem services. The third section of the course is made up of a series of case studies, some of which focus on a single ecosystem service while others evaluate multiple services. In this section, students will compare and contrast the various approaches used, evaluate the level of natural and social science integration, and identify major challenges that remain.

26. Climate Change and Natural Disasters

Global climate change is one of the most serious global challenges of our times. It is an ongoing process caused by our increasing emissions of greenhouse gases. The effects from atmospheric warming are increasing and are increasingly serious. The societies we live in which are already

regularly subjected to different types of natural and man-made environmental disasters. Disasters and risks are increasing in both severity and frequency as human settlements expand into new regions, we begin to exploit more resources, and as global temperatures increase, and our climate changes around us. The impact of climate change on our world and way of life is not to be underestimated, and the consequences of not adapting to our new reality could be disastrous.

This course aims to introduce students to the basic science of global climate change, its future trajectories and most common effects. Students will also learn to understand and respond to many of the arguments of climate change denial. Then students will be introduced to concepts of disaster risks and concepts in disaster and emergency management as they relate to the natural environment and the impacts of climate change. The course will cover an introduction to the types, causes and impacts of natural and environmental disasters; an explanation of the connections between climate change and the frequency and severity of natural disaster occurrences; an overview of climate and disaster risk analysis, and disaster and emergency management strategies that can be employed to mitigate the impacts of such occurrences; and the importance of not just preparing for and mitigating disasters, but adapting our societies to the new realities we face under climate change.

27. Agro-ecology Integrated Crop Management

This is an advanced 6-credit course for students interested in the ecology of agricultural systems, the environmental impacts of crop production, agro-ecology and sustainable agriculture. An agro-ecological approach, the application of ecological concepts and principles for the improvement of cropping systems, is emphasized. Students will gain a more in-depth understanding of inputs and outputs in agricultural systems and their relation to primary productivity, nutrient cycling, energy flows, and species interactions on farms. Topics include agricultural intensification, organic farming, forestry, agro-ecosystem structure and function, aspects of technology adoption, soil erosion and conservation, tillage systems, plant pests and diseases, weed ecology and management, nutrient dynamics and management, water quality, crop rotation, cropping system diversification.

28. Environmental & Socio-Economic Impacts of Mining

This course aims to provide a comprehensive and practical understanding of both positive and negative impacts that mining may have on the environment, economic and society. Hence, it will focus on the environmental and social impacts of mining, with particular emphasis on mining around the world.

We are all touched by mining, whether through the commodities we consume, the investments we make, the environmental and social impacts we experience, and/or the benefits we inherit. Therefore, the mining and mineral extraction have significant contribution to the advancement of human civilization and national economies. However, these activities also have the potential for serious environmental and social impacts.

On completion of this course, students should be able to identify and analyze the major issues and management strategies associated with environmental, social and economic impacts of mining. Prerequisite of the course: EMSD course

29. Environmental Accounting and Management

The overall aim of the course is to give an introduction to how companies and organizations deal with environmental and sustainability matters. The course reflects different strategies, tools and accounting systems being used in the current development process and the driving forces behind them. The course discusses both process and product development in different companies related to sustainable development. The course will also introduce to students the global reforms on Environmental Management Accounting and how these can be used to deal with environmental issues of their firms. In addition, basic concepts such as sustainable development, ecological efficiency, eco-efficiency are reviewed, as well as the three bottom lines: economics, environment and corporate social responsibility, CSR. Social responsibility implies that existing and new enterprises take into consideration the rights and needs of the local population and that employees work under safe conditions with regards to health, environment and security.

400 Level

30. Senior Thesis Seminar

Environmental Studies Senior Seminar brings together majors with different course backgrounds to analyze environmental problems using an interdisciplinary approach. The seminar will guide students through key issues in research design, from choosing a topic, through selecting approaches to researching it, to conducting research, drawing conclusions and summarizing the results in written form. While the students will be able to draw on a textbook to aid them in understanding the research process in ecological science, emphasis will be placed on how such research is actually conducted. To this end, the students will review and discuss empirical articles published in a variety of social science journals. At the end of semester, students will focus mostly on completing their research and writing of the thesis. Each student will be required to present the results of their research to their colleagues at the end of the course.

Class Attendance Policy

Attendance is essential. The student is expected to attend all classes and to willingly participate in class discussions. Attendance for each class will be taken and missing classes may be reflected in your grade. The lecture objectives for each week shall be reviewed and the assigned readings completed prior to the lecture for that material.

Library:

Email: library@auca.kg

Facebook link: <https://www.facebook.com/AUCALibrary/?ref=settings>

Webpage: <https://library.auca.kg/>

For reference and research help:

Tolgonai (0702) 163-472; kozhokanova_t@auca.kg

Zhuzumkan (0999) 107-303; askhatbekova_z@auca.kg

Aman (0555) 424-152; chukin_a@auca.kg

Job or internship opportunity

Governmental Ministries, Agencies and Departments

State Agency on Environment Protection and Forestry under the Government of the Kyrgyz Republic.

State Agency on Natural Resources and Minerals

Academics, Universities such as:

KNU - Kyrgyz National University

KRSU - Kyrgyz Russian Slavic University

OSH ST - Osh State University

BHU - Bishkek Humanities University

KUMTOR - Kumtor Gold Company

UNDP - United Nations Development Program

ADB - Asian Development Bank

WB - World Bank

GEF - Global Environment Facility

SDC - Swiss Agency for Development and Cooperation

JICA - Japan International Cooperation Agency

GTZ - German Technical Cooperation DEFRA - Britain's Department for the Environment, Food and Rural Affairs

USAID - US Agency for International Development

TACIS - Technical Assistance to CIS countries

SIDA - Swedish International Development Cooperation Agency

Helvetas - Swiss Association for International Cooperation Aga Khan Foundation

ECO - Economic Cooperation Organization

UNESCO - United Nations Educational, Scientific, and Cultural Organization

OSCEO - Organization for Security and Cooperation in Europe

CGIAR - Consultative Group on Agriculture Research

FAO - Food and Agriculture Organization

IFAD - International Fund for Agricultural Development

DFID - Department for International Development

ICARDA - International Centre for Agricultural Research in the Dry Area

The French Kyrgyz Association of Ecotourism (AFKE) is a non-profit association (association law 1901) which was created in 2007 to bring France and Kyrgyzstan closer together in terms of tourism and to help the development of ecological tourism in Kyrgyzstan. More generally, we participate in the protection of the environment of Kyrgyzstan. Our association brings together people concerned with promoting sustainable tourism and creating economically viable tourism projects while preserving the environment as well as possible. AUCA and AFKE are partners in protecting and developing the Karagachevaya Rosha Park, the largest green space in the city of Bishkek. This project was launched in 2018. Several bachelor's theses of the ESCS program have a topic linked to this project. Former students have also worked on this project or completed an internship. A photo album is available at the office or online on request.

Where exchange students and graduates study:

- Norwegian University of Life Sciences
- BARD College
- Central European University in Hungary
- The Helmholtz-Centre Potsdam– GFZ German Research Centre for Geosciences
- the University of Eberswalde on Sustainable Development (HNEE).

Diversity statement

The faculty and staff of ESCS Programme value and are committed to fostering diversity in the classroom and in the University. By respecting differences in culture, age, gender, gender expression, race, ethnicity, national origin, differing abilities, sexual orientation, and religious affiliation, we enrich the learning environment, enhance personal creativity and self-development of all.

Sustainability Board

The Sustainability Board is the advisory body of the AUCA Environmental Sustainability program. The representatives come from business, government, and academia with the goal of forming a curriculum and study experience that prepares students for the environmental challenges that face Central Asia today, and will have consequences for the entire world in the future.

Emergency

- **Emergency Contacts in Kyrgyzstan**
 - 101 - Fire Dept
 - 102 - Police
 - 103 - Public Ambulance Service
 - 151 - Private Ambulance Service (paid)
- **Emergency Contacts at AUCA**

According to AUCA regulations, all visitors to campus (including staff, students, and faculty) must show their valid AUCA ID card before entering the premises. This policy is in place to ensure the security of the university, but if you find yourself in an Emergency situation on campus please contact the following departments as quickly as possible.

- *AUCA Security Services*
Bekbolot Abdylidabekov
Senior Specialist of AUCA Security Service
Tel: +996 (312) 66 11 18, Ext. 221 (also 278, 220)
E-mail: abdylidabekov_b@auca.kg

AUCA Medical Services
AUCA Main Building Room 219
Tel: + 996 (312) 66 15 13 Ext.: 219
E-mail: medoffice@auca.kg
Working Hours: Monday-Friday 8.30 a.m. – 5 p.m.

For non-Emergency situations, please see the webpages of the [AUCA Medical Services](#) and [AUCA Security](#) departments.

Communication

Facebook Page: <https://www.facebook.com/groups/742682835817745/>

Web page: https://auca.kg/en/sustainable_development/

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