

SOIL ECOLOGY

Spring semester, 2019-2020

Coordinator	Irina Bezkorovaynaya (Siberian Federal University, Russia)
Credits	3 ECTS (optional course), 54 in-class hours
Lecturer	Irina Bezkorovaynaya (Siberian Federal University, Russia)
Level	BSc
Host institution	Siberian Federal University , School of Ecology and Geography, Department of Ecology and Environmental Management
Course duration	1 semester (according to universities' curricula)

Summary

The investigation of influence of soil biological processes and soil biota on global changes, especially in relation to global greenhouse gases and carbon cycle, necessitates knowledge of biological diversity and functions of soil biota.

Particular attention to soil biota functioning in different climatic and soil conditions, including permafrost ecosystems are paid.

Target student audiences

2-year BSc students in ecology and environmental management

Prerequisites

Required courses (or equivalents):

Soil science

Fundamental ecology

Ecology of microorganisms

Plant ecology

Animal ecology

Goals and objectives

The main course objective is to review the theoretical foundations of soil biology and identify the features of soil biological processes in various climatic and soil conditions, including permafrost soils.

Course objectives:

1. To give theoretical foundations of soil biology.
2. To analyze role of soil biota in ecosystem functioning in various climatic and soil conditions.
3. To give a comprehensive overview of modern approaches to study biological processes in soils.

General learning outcomes:

By the end of the course, successful students will:

- know the fundamentals of soil biology;
- know the place and role of soil biota in ecosystem functioning in various climatic and soil conditions, including permafrost ecosystems;
- be able to analyze data on primary and secondary production processes in soils.

Overview of sessions and teaching methods

The course will include classroom and distance training using e-learning technologies.

The lessons in the audience will include lecture, interactive technologies, such as group work, discussions and the mini-conference.

During the self-studying according to practical lessons students should read, make notes of the publications proposed by the teacher, and be ready to discuss given topics.

Course workload

The table below summarizes course workload distribution:

Activities	Learning outcomes	Assessment	Estimated workload (hours)
In-class activities			
Lectures	Knowledge of theory, concepts, methodology of soil biology	Class participation	36
Moderated in-class discussions	Understanding the place and role of soil biota in the ecosystem functioning; - be able to analyze data on primary and secondary production processes in soils.	Class participation and preparedness for discussions	9
In-class assignments for group work	The ability of successful communication to address issues related to the assessment of the role of soil biota in ecosystem functioning in various climatic and soil conditions	Class participation and preparedness for discussions	9
Independent work			
Preparation of a presentation for discussion at the mini-conference	The ability to competently and effectively present the material to the audience and enter into a discussion	Presentation quality	18
Performance of control tasks on the on the e-learning course	Knowledge the fundamentals of soil ecology and be able to analyze data on primary and secondary production processes in soils	Completed task on the e-learning course	18
Reading and discussion of assigned papers for seminars and	Familiarity with and ability to critically and creatively discuss key concepts, tools and methods as presented	Class participation, creative and active contribution to discussion	18

preparation for lectures	in the literature		
Total			108

Grading

The students' performance will be based on the following:

Each student performs home assignment on the e-learning course - 20% of points.

At each seminar, students perform personal or group assignments - 60% of points.

The final presentation on mini-conference will be presented at the end of the course - 20% of the total points.

Course schedule

Day	Time	Topic	Lecturer
January 23, 2020 Thursday	10:15-11:50	Lecture: Introduction to soil biology. Modern problems of soil biology.	Irina Bezkorovaynaya
January 29, 2020 Wednesday	15:55-17:30	Seminar: Modern problems of soil biology.	Irina Bezkorovaynaya
January 30, 2020 Thursday	10:15-11:50	Lecture: The fitness of the soil environment.	Irina Bezkorovaynaya
January 30, 2020 Thursday	10:15-11:50	Lecture: The role of soil in evolution of living matter. The peculiarity of the living matter of terrestrial ecosystems. The planetary role of living matter.	Irina Bezkorovaynaya
February 05, 2020 Wednesday	15:55-17:30	Seminar: The fitness of the soil environment.	Irina Bezkorovaynaya
February 06, 2020 Thursday	10:15-11:50	Lecture: Soil producers of organic matter. The roots of higher plants.	Irina Bezkorovaynaya
February 13, 2020 Thursday	10:15-11:50	Lecture: The diversity of soil algae. Ecological and trophic relationships of soil producers with other representatives of soil biota.	Irina Bezkorovaynaya
February 19, 2020 Wednesday	15:55-17:30	Seminar: The diversity soil producers of organic matter.	Irina Bezkorovaynaya
February 27, 2020 Thursday	10:15-11:50	Lecture: Soil microorganisms. Ecological and trophic diversity of soil fungi and bacteria.	Irina Bezkorovaynaya
March 05, 2020 Thursday	10:15-11:50	Lecture: Soil fauna: diversity and function.	Irina Bezkorovaynaya
March 11,	15:55-	Seminar: Ecological and trophic relationships	Irina

2020 Wednesday	17:30	of soil micro- and macroorganisms.	Bezkorovaynaya
March 12, 2020 Thursday	10:15- 11:50	Lecture: Geography of soil diversity. Soil biota of extreme cryogenic ecosystems (Arctic, Subarctic ecosystem).	Irina Bezkorovaynaya
March 19, 2020 Thursday	10:15- 11:50	Lecture: Functional groups of soil organisms.	Irina Bezkorovaynaya
March 25, 2020 Wednesday	15:55– 17:30	Seminar: Functional diversity of soil biota in extremal cryogenic ecosystems (Arctic, Subarctic ecosystem).	Irina Bezkorovaynaya
March 26, 2020 Thursday	10:15- 11:50	Lecture: Elementary soil biological processes: litter formation.	Irina Bezkorovaynaya
April 02, 2020 Thursday	10:15- 11:50	Lecture: Elementary soil biological processes: humus formation; decomposition of humus; mineral formation; biodegradation of minerals.	Irina Bezkorovaynaya
April 08, 2020 Wednesday	15:55– 17:30	Seminar: The participation of functional groups of soil biota in elementary soil biological processes.	Irina Bezkorovaynaya
April 09, 2020 Thursday	10:15- 11:50	Lecture: Ecological successions of soil biota in the process of transformation of soil organic matter (microorganisms and soil invertebrates).	Irina Bezkorovaynaya
April 16, 2020 Thursday	10:15- 11:50	Lecture: Features of soil food webs.	Irina Bezkorovaynaya
April 29, 2020 Wednesday	15:55– 17:30	Seminar: Ecological successions of soil biota in the process of transformation of soil organic matter (microorganisms and soil invertebrates).	Irina Bezkorovaynaya
April 30, 2020 Thursday	10:15- 11:50	Lecture: The participation of soil organisms in the biological cycle.	Irina Bezkorovaynaya
May 07, 2020 Thursday	10:15- 11:50	Lecture: Metabolic and modulating soil processes.	Irina Bezkorovaynaya
May 13, 2020 Thursday	15:55– 17:30	Seminar: Metabolic and modulating soil processes.	Irina Bezkorovaynaya
May 14, 2020 Wednesday	10:15- 11:50	Lecture: Soil biota and soil health.	Irina Bezkorovaynaya
May 21, 2020 Thursday	10:15- 11:50	Lecture: Soil biota in environmental control. Methods of soil bioindication. The basic principles of their use.	Irina Bezkorovaynaya
May 27, 2020 Wednesday	15:55– 17:30	Seminar: Soil biota in environmental control.	Irina Bezkorovaynaya

May 28, 2020 Thursday	10:15- 11:50	Lecture: The importance of soil-biological research for understanding the processes of functioning of the biosphere.	Irina Bezkorovaynaya
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Literature

Coleman, D. C., Callaham, M. A., & Crossley Jr, D. A. (2017). Fundamentals of soil ecology. Academic press. ISBN: 978-0-12-805251-8

Lavelle, P., & Spain, A. V. (2001). Soil ecology. Springer Science & Business Media. ISBN: 0-306-48162-6

Soil Atlas of the Northern Circumpolar Region <https://esdac.jrc.ec.europa.eu/content/soil-atlasnorthern-circumpolar-region>

Global soil biodiversity atlas <https://www.globalsoilbiodiversity.org/atlas-introduction>