Climate change impact on agriculture - current situation and prospects for the future		
Institute of Plant Genetics of the Polish Academy of Sciences	Prof. dr hab. Zbigniew W. Kundzewicz kundzewicz@yahoo.com Coordinator	Lecturers: research workers of the Institute of Agricultural and Forest Environment of the PAS, Institute of Plant Genetics PAS, Institute of Dendrology of the PAS, University of Life Sciences in Poznań, and Institute of Cultivation Fertilization and Soil Science - NRI

General informations:

Type of activities	Introductory video, lecture series: 16 x 45 minutes and written exam (90 minutes)
Didactic cycle	Autumn-winter 2019/2020
Language	English
ECTS score	2

Objective of the course: To expand knowledge of climate change and its impacts, as well as the possibilities of climate change mitigation and adaptation as well as the relationship between climate, vegetation and agriculture in the context of already observed changes and projections for the future.

Lecture list:

1. Lecture subject: **Climate change and its impacts - observations and projections**
Lecturer: prof. dr hab. Zbigniew Kundzewicz, Institute of Agricultural and Forest Environment of the PAS
Lecture day: **8 October 2019**
Lecture time: **9:00-10:30**
Expected learning outcomes
PhD student:

- ✓ acquires orientation in factors influencing the Earth's climate and radiative forcing,
- ✓ understands the essence of the greenhouse effect and the mechanism of the current climate change,
- ✓ is aware of climate change impacts in various regions and sectors / systems,
- ✓ can discuss the observed trends in temperature and precipitation changes in different time and space scales,
- ✓ can determine the significance of natural climate variability,
- ✓ is familiar with the overall projection of the climate change and its impacts for the future.

2. Lecture subject: **Weather extremes in a changing climate**
Lecturer: prof. dr hab. Zbigniew Kundzewicz, Institute of Agricultural and Forest Environment of the PAS
Lecture day: **8 October 2019**
Lecture time: **11:00-12:30**
Expected learning outcomes
PhD student:

- ✓ understands the nature of changes in weather extremes (heat waves; heavy rainfall and floods; hail; meteorological, hydrological and agricultural drought),
- ✓ knows the factors that shape hazard, exposure and sensitivity,
- ✓ can discuss the observed trends in changes in weather extremes,
- ✓ is familiar with the overall results of the projection of weather extremes for the future.

3. Lecture subject: **Expanding knowledge on the impact of climate change on the characteristics of Scots pine**

Lecturer: prof. dr hab. Jacek Oleksyn, Institute of Dendrology of the PAS

Lecture day: **29 October 2019**
Lecture time: **9:00-10:30**
Expected learning outcomes
PhD student:

- ✓ PhD student gets to know the changes that took place under the influence of changing climatic conditions in the ecology and biology of Scots pine (*Pinus sylvestris* L.),
- ✓ is familiar with the changes in ecology and biology of Scots pine under the influence of changing climatic conditions,
- ✓ can consider potential scenarios for pine biology changes.

4. Lecture subject: **Adaptation to climate change in agriculture: framework, priorities on the way from agronomy to agroecology**
Lecturer: dr hab. Jerzy Kozyra, Institute of Cultivation Fertilization and Soil Science - NRI
Lecture day: **4 November 2019**
Lecture time: **12:30-14:00**
Expected learning outcomes
PhD student:

- ✓ describe the scheme of agricultural activities as part of the adaptation process to climate change,
- ✓ indicate the main Institutions and regulations in the field of adaptation to climate change,
- ✓ list the priorities for climate change adaptation,
- ✓ define the concept of agroecology,
- ✓ characterize the main aspects of climate change related to soil water,
- ✓ knows the main carbon resources in the environment and importance of carbon cycle in agriculture,
- ✓ characterize sources of greenhouse gas emissions in agriculture,
- ✓ characterize selected adaptive practices in agriculture.

5. Lecture subject: **Plant pathogens versus climate change**
Lecturer: prof. dr hab. Małgorzata Mańka, University of Life Sciences in Poznań
Lecture day: **26 November 2019**
Lecture time: **9:00-10:30**
Expected learning outcomes
PhD student:

- ✓ understands the importance of providing healthy food in adequate quantities,
- ✓ knows the importance of plant protection to food products,
- ✓ understands the importance of agrotechnical method for preventing the spread of crop pathogens,
- ✓ knows the forecasts related to phytopathological problems in agriculture,
- ✓ is able to name the sources of threat to plant yield,
- ✓ can list pathogens of arable crops and trees that are gaining and losing the significance.

6. Lecture subject: **Climate change and agriculture and ecosystems**
Lecturer: prof. dr hab. Zbigniew Kundzewicz, Institute of Agricultural and Forest Environment of the PAS
Lecture day: **10 December 2019**
Lecture time: **9:00-10:30**
Expected learning outcomes
PhD student:

- ✓ understands the impact of climatic conditions on agriculture, in particular restrictions related to temperature and humidity,
- ✓ is aware of climate threats in relation to agricultural production and rural development,

- ✓ knows climatic and non-climatic factors affecting agriculture and ecosystems,
- ✓ can discuss climate change impacts in agriculture in the context of existing observations and future projections,
- ✓ can identify reasons of concern related to polar ecosystems, small islands and coral reefs.

7. Lecture subject: **Climate change mitigation and adaptation**
Lecturer: prof. dr hab. Zbigniew Kundzewicz, Institute of Agricultural and Forest Environment of the PAS
Lecture day: **10 December 2019**
Lecture time: **11:00-12:30**
Expected learning outcomes
PhD student:

- ✓ understands the importance of components of the Earth's energy balance and the possibility of controlling the greenhouse effect,
- ✓ is aware of the basic threats and risks and the possibility of adaptation to climate change impacts in sectors and systems,
- ✓ can discuss the possibilities of reduction of atmospheric greenhouse gas concentrations to combat climate change,
- ✓ can explain the sense of climate policy and its relationship with the concept of sustainable development,
- ✓ can present examples of trade-offs and synergies between actions aimed at climate change mitigation and adaptation.

8. Lecture subject: **Strategies of resistance to abiotic stresses in plants**
Lecturer: dr hab. Arkadiusz Kosmala, prof. IPG PAS, Institute of Plant Genetics PAS
Lecture day: **7 January 2020**
Lecture time: **9:00-10:30**
Expected learning outcomes
PhD student:

- ✓ can define drought resistance and winter-hardiness,
- ✓ knows strategies of resistance to drought in plants,
- ✓ understands and can characterize the selected elements of plant reactions to water deficit,
- ✓ understands and can characterize the selected elements of plant reactions to low temperature,
- ✓ knows the essential physiological parameters describing plant metabolism under stress conditions,
- ✓ can describe and explain the role of photosynthetic apparatus and antioxidative system in the mechanisms of drought resistance and winter-hardiness.

9. **Written exam**:
Examiner: prof. dr hab. Zbigniew Kundzewicz, Institute of Agricultural and Forest Environment of the PAS
Member of the Commission:

- ➢ prof. dr hab. Małgorzata Jędryczka, Institute of Plant Genetics PAS,
- ➢ dr hab. Lidia Błaszczyk, Institute of Plant Genetics PAS.

Exam day: **21 January 2020**
Exam time: **9:00-10:30**