GHENT UNIVERSITY

Course Specifications

Valid in the academic year 2021-2022

Meteorology and Ecoclimatology (I002655)

Due to Covid 19, the education and assessment methods may vary from the information displayed in the schedules and course details. Any changes will be communicated on Ufora.

Course size *(nominal values; actual values may depend on programme)*

Credits 5.0 **Study time 150 h** **Contact hrs** 50.0h

Course offerings and teaching methods in academic year 2021-2022

A (semester 1)	Dutch	Gent	seminar: coached exercises	5.0h
			microteaching	2.5h
			group work	2.5h
			demonstration	2.5h
			lecture	30.0h
			seminar: practical PC room classes	7.5h

Lecturers in academic year 2021-2022

Verbeeck, Hans	LA20	lecturer-in-charge
De Frenne, Pieter	LA20	co-lecturer

Offered in the following programmes in 2021-2022	**crdts**	**offering**
Master of Science in Bioscience Engineering: Forest and Nature Management	5	A
Master of Science in Bioscience Engineering: Land, Water and Climate	5	A

Teaching languages

Dutch

Keywords

Meteorological phenomena, global circulation, weather, weather stations, weather models, climate distribution, bioclimatology, microclimate, vegetation models

Position of the course

The part meteorology analyses the various physical phenomena which form the background of weather mechanisms and weather and climate formation. Insight is provided for the prevailing types of weather, weather maps and weather prediction. The part ecoclimatology builds on the basic meteorological principles for understanding the climate distribution over the Earth and the interaction between climate and vegetation. We focus on: impact of weather and climate variation on vegetation, microclimate in terrestrial ecosystems and vegetation modelling. The practical training aims at the knowledge of the use and interpretation of weather station data, weather maps, calculation exercises and a vegetation modelling exercise. *The course serves as core element within the climate pillar of the master's program and complements other courses on land-atmosphere interactions, climate change processes, hydrology, biogeochemistry, and environmental sciences.*

Contents

THEORY

1. Introduction: Atmosphere of the earth, energy and light

- Composition of the atmosphere
- Thermal and chemical layering of the atmosphere
- Introduction to weather and climate
- Energy, temperature and heat
- Radiation
- Energy balance

2. Temperature, humidity and clouds

- Temporal and spatial temperature variation

- Air temperature data
- Atmospheric moisture (psychrometry)
- Dew, fog and cloud-types

3. Atmospheric stability, cloud development, precipitation
- Stable, unstable and neutral atmospheric conditions (brief recap)
- Cloud development
- Precipitation processes and types

4. Pressure, winds
- Atmospheric pressure
- Forces
- Geostrophic wind, gradient winds, surface winds
- Small scale and local wind systems

5. Global circulation
- Global wind systems
- Atmosphere-ocean interactions, including El Niño Southern Oscillation
- Monsoons, jet streams, Rosby waves, atmospheric rivers

6. Fronts, weathermaps and forecasting
- Air masses and fronts
- Middle latitude cyclones (polar front theory)
- Weather forecasting

7. Numerical weather prediction
- Atmospheric models
- Weather models

8. Global Climate- The Köppen classifications principles
-.Overview of the different climates
- Geographic climate distribution
- Vegetation types/zones

9. Impacts of climate variability on vegetation
- Seasonality
- Inter annual climate variability
- Impacts on phenology, growth and carbon cycle
- Impacts of extreme events on vegetation, legacy effects

10. Microclimate within ecosystems
- Impact of ecosystems on microclimate
- Microclimate effect on plant canopy and ecosystem processes
- Micrometeorological observations, eddy covariance

11. Vegetation modelling
- Dynamic global vegetation models
- Simulating the impact of climate variation on carbon, energy and water balance of vegetation

PRACTICALS

1. Demonstration of sensors for radiation, air temperature, air humidity, wind speed, wind direction, precipitation and dew formation
2. Processing and interpretation of meteorological data of fluxtower stations
3. Calculation exercise on cloud formation
4. Interpretation of weather maps and weather prediction
5. Vegetation modelling exercise (LPJ guess educational version)

Initial competences

This course builds upon learning outcomes from the course units: 'earth sciences", 'ecology', 'Land–Atmosphere Interactions', 'Environmental Sciences', these learning outcomes may have been achieved differently.

Final competences

1 Explain meteorological phenomena leading to weather and climate formation

2 Analyse weather maps and make simple weather prediction based on these maps
3 Explain global climate and circulation patterns
4 Analyse and interpret meteorological data
5 Recognise cloud types
6 Appreciate the scientific uncertainties on the complex climate system
7 Understand complex interactions between climate and vegetation

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Demonstration, Group work, Microteaching, Lecture, Seminar: coached exercises, Seminar: practical pc room classes

Learning materials and price

Lecture hand-outs
Syllabus is provided via Ufora (gratis)

References

Meteorology Today: An Introduction to Weather, Climate and the Environment, 12th Edition
C. Donald Ahrens,
Robert Henson, 2019.
Bonan, G.B. 2016. Ecological Climatology: Concepts and Applications. 3rd edition. Cambridge University Press, Cambridge. 692 pp.

Course content-related study coaching

Individual coaching is possible, including interactive via Ufora

Assessment moments

end-of-term and continuous assessment

Examination methods in case of periodic assessment during the first examination period

Oral examination

Examination methods in case of periodic assessment during the second examination period

Oral examination

Examination methods in case of permanent assessment

Simulation, Report, Participation, Peer assessment

Possibilities of retake in case of permanent assessment

examination during the second examination period is possible in modified form

Calculation of the examination mark

The total score is 60% periodic evaluation (oral exam) and 40% non-periodic evaluation (particpation, simulation and report practicals)