

...Meteorology and Climatology..I.

(Environmental engineering, 1st Year of study, 1st Semester)

Credits (ECTS): 4

Course category: Domain-specific discipline (mandatory)

Course holder: Lecturer Ilie BODALE, PhD

Objectives of the discipline:

The discipline objectives consist in the study of the main meteorological phenomena and their influence on the environment, plants, animals and people.

Contents (syllabus)

Course (chapters/subchapters)
1. Introduction to meteorology and climatology 1.1. Weather and climate. Branches of meteorology. 1.2. Weather station. Measurements and observations.
2. Earth's atmosphere 2.1. The chemical structure of the atmosphere. 2.2. The vertical thermal structure of the atmosphere.
3. Solar radiation 3.1. The spectrum of solar radiation. 3.2. Insolation. 3.3. Direct solar radiation. 3.4. Diffusion of solar radiation. 3.5. Absorption of solar radiation. 3.6. Terrestrial and atmospheric radiation. The albedo. 3.7. The radiative balance.
4. Soil and air temperature 4.1. Soil temperature. The mechanism of soil heating. 4.2. Factors influencing soil warming. 4.3. Diurnal and annual variation of soil temperature at different depths. 4.4. Air temperature. Air heating mechanisms. 4.5. Absorption and transmission of radiation by different gases. The greenhouse effect. 4.6. The multilayer model. 4.7. Diurnal and annual variation of air temperature.
5. Water vapor in the atmosphere 5.1. Air humidity. Specific, absolute and relative humidity. 5.2. Dew point. 5.3. Diurnal and annual variation of humidity. 5.4. Evaporation and evapotranspiration.

<p>6. Primary products of water vapor condensation</p> <p>6.1. Fog. Formation mechanisms. Types of fog.</p> <p>6.2. The clouds. International Classification of Clouds.</p> <p>6.3. The nebulosity.</p>
<p>7. Precipitation</p> <p>7.1. Atmospheric precipitation. Classification of precipitates</p> <p>7.2. Formation mechanisms. Bergeron's theory.</p> <p>7.3. Diurnal and annual variation of precipitation.</p>
<p>8. Atmospheric pressure</p> <p>8.1. Variation of atmospheric pressure with altitude.</p> <p>8.2. Main baric forms: Cyclone. The anticyclone.</p> <p>8.3. Secondary baric forms</p> <p>8.4. Diurnal and annual variation of atmospheric pressure.</p>
<p>9. Dynamics of air masses</p> <p>9.1. Air masses. Classification of air masses.</p> <p>9.2. Atmospheric fronts. Warm, cold and occluded fronts.</p> <p>9.3. Air circulation around the globe.</p> <p>9.4. The winds. Formation mechanisms. Classification of winds.</p> <p>9.5. Winds around the globe, in Europe and Romania.</p>
<p>10. Electrical and optical phenomena in the atmosphere</p> <p>10.1. Electrical phenomena in the atmosphere. Classification of electrical discharges.</p> <p>10.2. Thunder and tornadoes.</p> <p>10.3. Optical phenomena.</p>

Practical activity
1. Presentation of objectives and work methodology in the laboratory;
2. Presentation of the main meteorological phenomena and devices
3. Measurements and observations in the meteorological station
4. Data processing. Calculation of daily, decadal, annual and multiannual averages of meteorological parameters.
5. Measurement of air and soil temperature
6. Graphic representation of minimum, average and maximum temperatures for a period.
7. Measurement of direct, diffuse and reflected solar radiation using the pyranometer.
8. Determination of the relative humidity of the air by different methods (Electric psychrometer, psychrometric table and hygrometer).
9. Observations on clouds. Determining different types of clouds.
10. Measuring the amount of precipitation. Determining the annual amount of precipitation in different climatic regions.
11. Measurement of atmospheric pressure. Sea level pressure reduction.
12. Measuring wind direction and speed using vane and anemometer.

Bibliography

1. Bodale I., 2020 – „*Biofizică și Agrometeorologie*”, Suport de curs USV Iași;
2. Oancea S., 2010 – „*Despre atmosfera, vreme și clima*”, Editura PIM, Iași,
3. Patra A.K., 2020 – „*Introduction to Agrometeorology and Climate Change*”, New India Publishing Agency (NIPA).
4. Bodale I., 2021 – „*Măsurarea și prelucrarea datelor meteorologice*”, Iași: Editura „Ion Ionescu de la Brad”
5. Bodale Ilie, 2020 – „*Referate pentru lucrările practice de meteorologie*”, USV Iasi

Evaluation

Evaluation form	Evaluation Methods	Percentage of the final grade
Final exam	Written examination	70 %
Evaluation of the activity during the semester	Written and oral assessments during the semester	30 %

Contact

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...Meteorology and Climatology...II.

(Environmental engineering, 1st Year of study, 2nd Semester)

Credits (ECTS): 3

Course category: Domain-specific discipline (mandatory)

Course holder: Lecturer Ilie BODALE, PhD

Objectives of the discipline:

The discipline objectives consist in study of the climatology and climatic change effects on environment.

Contents (syllabus)

Course (chapters/subchapters)
1. Climate evolution in different geological eras 1.1. Paleoclimate. 1.2. Climate in the Holocene. 1.3. Climate in our era. 1.4. Climatic cycles. Climate in the last century.
2. Methods of determining climatic epochs 2.1. Oxygen isotope method. 2.2. Milankovitch cycle. 2.3. "Bare rock" model. 2.4. The "Snowball" pattern. Sea level changes.
3. Genetic factors of climate 3.1. Radiative factors. 3.2. Physical-geographical factors. 3.3. Dynamic factors. 3.4. Anthropogenic factors.
4. Koppen-Trewartha classification of climates 4.1. Koppen classification. Characteristics of different climates. Climate formulas. 4.2. Advantages and disadvantages of the Koppen classification. 4.3. Trewartha-Horn classification.
5. Characterization of the climate in Europe and Romania 5.1. The factors that influence Romania's climate. 5.2. Climate in Europe and Romania.
6. Climatic risks 6.1. The frost. The fight against frosts. 6.2. Hail. Hail formation mechanism. The fight against hail. 6.3. Drought. Effects of drought. 6.4. Blizzard, storms and tornadoes.

<p>7. The effects of pollution on the climate. Long-term climate scenarios (2100)</p> <p>7.1. Changing the composition of the air through anthropogenic actions</p> <p>7.2. Anthropogenic greenhouse effect emissions</p> <p>7.3. The influence of long-term pollution.</p> <p>7.4. Climatological scenarios</p>
<p>8. Global climate change</p> <p>8.1. Modification of the chemical composition of the atmosphere by anthropogenic factors.</p> <p>8.2. Global warming. The increase in air temperature in Romania.</p> <p>8.3. The effects of climate change.</p> <p>8.4. Measures to prevent the effects of climate change</p>

Practical activity
1. Presentation of the main climatological characteristics at the global level. Distribution of plants according to climatic characteristics.
2. Atmospheric fronts. Identifying different types of fronts.
3. Weather characterization methods based on meteorological observations.
4. Climatic formulas. Identification and characterization of climates based on climate formulas.
5. Identifying the climate in Europe and Romania.
6. Climate Change. The air temperature change in Iasi during the period 1961-2019.
7. Climatic risks and their analysis on the territory of Romania.

Bibliography

1. Bodale I., 2020 – „*Biofizică și Agrometeorologie*”, Suport de curs USV Iași;
2. Oancea S., 2010 – „*Despre atmosfera, vreme și clima*”, Editura PIM, Iași,
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4. Bodale I., 2021 – „*Măsurarea și prelucrarea datelor meteorologice*”, Iași: Editura „Ion Ionescu de la Brad”
5. Bodale Ilie, 2020 – „*Referate pentru lucrările practice de meteorologie*”, USV Iasi
6. Liviu Mihai Irimia (coordonator), autori: D. Cazacu, V. Vlahidis, C. Sîrbu, I. Bodale, et al, 2021 – „*Manual de practică. Specializarea Horticultură*”, vol. 1, Iași, Editura Ion Ionescu de la Brad.

Evaluation

Evaluation form	Evaluation Methods	Percentage of the final grade
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