

## **Biophysics and Agrometeorology (1th Year of study, 1th Semester)**

**Credit value (ECTS): 4**

### **Course category**

Domain (Imposed)

### **Course holder:**

**PhD Ilie BODALE, Assistant professor**

### **Discipline objectives (course and practical works)**

The aim of the course is to acquiring the theoretical and practical notions of biophysics and agrometeorology to understand the mechanisms of functioning of living organisms and the environment.

- developing an independent and efficient study method by using appropriate bibliographic resources;
- developing the practical abilities to work in laboratory.

### **Contents (syllabus)**

<b>Course (chapters/subchapters)</b>
<b>The object of study, the importance of biophysics and methods used</b>
<b>Biophysics of fluids</b> The surface and contact phenomena (surface layer, surface tension) The liquid-solid-gas contact phenomena (capillarity, adsorption and absorption) The molecular transport phenomena (viscosity, diffusion and osmosis).
<b>Biological thermodynamics</b> Thermodynamics systems and parameters Principles of thermodynamics Thermodynamics of biological processes. Horticultural applications of thermodynamic principles.
<b>Perturbations and radiations</b> Sound and ultrasound. Applications. The effects of sounds and ultrasound on biological systems. Non-ionizing radiation. Effects of IR, MW and US radiations on living organisms. Natural and artificial radioactivity. Ionizing radiation Effects of ionizing radiation on organisms.
<b>Meteorology.</b> Weather and climatology Weather station. Meteorological measurements and observations.
<b>Atmosphere and solar radiation</b> Earth's atmosphere. Thermal and chemical structure of atmosphere. Solar radiation: direct, diffuse, absorbed and reflected. Albedo. Insolation. Radiation balance.

**Soil and air temperature**

Soil temperature. Heat transfer in soil.

Factors which influence the heating of the soil.

Daily and annual soil temperature variations at different depths.

Air temperature.

Heat transfer mechanisms in air. Radiation absorption and transmission in different gases.

Greenhouse effect.

Daily and annual air temperature variations.

**Dynamics of air masses**

Air masses. Air masses classification.

Atmospheric pressure. Variation of pressure with altitude. Pressure systems.

Atmospheric fronts. Hot, cold and occluded fronts.

Winds. Genesis. Wind classification.

Winds in Europe and Romania.

**Water vapors and precipitations**

Air humidity. Specific, absolute and relative humidity of the air. The dew point.

Condensation of water vapors in the atmosphere. Dew, fog and clouds. Cloud classification.

Atmospheric precipitation. Precipitation classification.

Evaporation and evapotranspiration.

**Influence of climatic factors on plant growth and development**

The influence of temperature.

The influence of light radiation.

The influence of water.

The influence of wind on plants. The mechanical, thermal and physiological effects produced by wind to the plants.

**Extreme weather events**

Frosts. Fight against frosts.

Hail. The mechanism of hail formation. Fight against hail.

Drought. The effects of drought.

Blizzards, storms and tornadoes.

**The global climate**

Genesis and climate characteristics.

Köppen climatic classification.

Climate in Romania.

Agroclimatology.

**Practicum**

Laboratory goals and work methodology;

Errors calculation. Data processing.

Determination of viscosity of liquids by using Ostwald viscometer.

Determination of surface tension coefficient of liquids by using Traube stalagmoneter.
Determination of fruit sugar concentration based on the refractive index of the juice.
Instruments and observations used in meteorology. Agrometeorological Bulletin.
Diagram of minimum, average and maximum temperatures for a period of time.
Determination of annual precipitation in different climatic regions.

### References

- Bodale Ilie, “Biophysics and Agrometeorology”, Course notes USAMV, 2019.
- Oancea Servilia, “Biophysics”, PIM Publishing, Iasi, 2005.
- Enache L., “Agrometeorology”, USAMV Publishing, Bucharest, 2009.
- Criveanu H., “Agricultural biophysics”, Digital Data Publishing, 2006.
- Oancea Servilia, “Practical works of physics and biophysics”, PIM Publishing, Iasi, 2009.

### Evaluation

Evaluation form	Evaluation Methods	Percentage of the final grade
Course	Course activity	10%
	Written exam	70%
Practical works	Laboratory activity evaluation	10%
	Projects	10%

### Contact

#### PhD. Ilie BODALE, Assistant professor

Faculty of Horticulture - USAMV Iași  
 3 Mihail Sadoveanu Alley, Iasi, 700490, Romania  
 Telephon: (+4) 0232 407 527  
 E-mail: [ilie.bodale@uaiasi.ro](mailto:ilie.bodale@uaiasi.ro)