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| **STUDY PROGRAMME:** | **Professional Undergraduate Study Programme Agriculture**  Specific field of study: Course foundations | |
| **Course:** | **SOIL SCIENCE** | |
| **Course code:** 273279  **Course Status**: compulsory | **Semester: I** | **ECTS credits: 6,5** |
| **Course holder:** | **Andrija Špoljar,** Ph.D., professor of professional studies | |
| **Modes of delivery:** | **Number of hours** | |
| Lectures | 45 | |
| Excersises, | 30 | |
| Seminars | 8 | |

**Course objectives**

The aim of the course is to present pedogenetic factors and processes, physical, chemical and biological characteristics of soil, and soil classification in Croatia. Students will collect soil samples in the field and determine analytical data in the laboratory, and will publicly present the results of their own research.

**Course content**

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| **Red.**  **br.** | **Course units** | **Modes of delivery:** | | | **Places of delivery** |
| **L** | **E** | **PT** |
| **Propedeutic teaching**: | | | | | Lecture hall |
|  | Initial test |  | 1 |  |
|  | Basic terms in biology | 2 |  |  |
|  | Basic terms and definitions in chemistry | 2 |  |  |
|  | Basic terms in physics, percentage calculation | 2 |  |  |
|  | Final test |  | 1 |  |
| **I** | **INTRODUCTION** | | | | |
| **1.** | **Development of pedology throughout history** | 1 |  |  | Lecture hall |
| **II** | **PEDOGENESIS** | | | | |
| 1. | **Pedogenetic factors** | 2 |  |  | Lecture hall |
| 1.1. | Parent substrate |
| 1.2. | Climate |
| 1.3. | Relief |
| 1.4. | Organisms |
| 1.5. | Time |
| 2. | **Pedogenetic processes** | 3 |  |  | Lecture hall |
| 2.1. | Depletion of primary minerals |
| 2.2. | Formation of secondary minerals |
| 2.3. | Decomposition of organic matter and formation of humus |
| 2.4. | Formation of organic-mineral compounds |
| 2.5. | Migration |
| 2.6. | Specific processes |
| **III** | **MORPHOLOGY** | | | | |
| 1. | External morphology | 1 |  |  | Lecture hall |
| 2. | Internal morphology |
| **IV** | **PHYSIOGRAPHIC CHARACTERISTICS OF THE SOIL** | | | | |
| 1. | **Pedophysics** |  | | | |
| 1.1. | **Physics of the solid phase** | 3 |  |  | Lecture hall |
| 1.1.1. | Texture, structure, soil density, porosity and consistency |
| 1.2. | **Liquid phase physics** | 4 |  |  | Lecture hall |
| 1.2.1. | Forms of water in the soil |
| 1.2.2. | Water constants |
| 1.2.3. | Energy relations of water in the soil |
| 1.2.4. | Water regime and water balance in the soil, movement of water in the soil |
| 1.3. | **The gaseous phase of the soil** | 1 |  |  | Lecture hall |
| 1.3.1. | Ecological significance of air in the soil |
| 1.3.2. | Soil aeration |
| 1.3.3. | Soil capacity for air |
| 1.4. | **Thermal characteristics of soil** |
| 1.4.1. | Soil heat capacity, specific heat, soil heat conductivity |
| 2. | **Soil chemistry** |  |  |  | Lecture hall |
| 2.1. | **Solid phase chemistry** | 3 |  |  |
| 2.1.1. | Chemical composition of the solid phase of the soil |
| 2.1.2. | Chemical composition of the solid phase of the soil |
| 2.1.3. | Humus |
| 2.1.4. | Sorptive capacity of the soil |
| 2.1.4.1. | Sorption of cations and anions |
| 2.2. | **Liquid phase chemistry** |  |  |  | Lecture hall |
| 2.2.1. | Concentration of aqueous solution | 3 |  |  |
| 2.2.2. | Active and potential acidity, basicity of the soil |
| 2.2.3 | Buffering capacity of the soil |
| 2.2.4. | Oxidation-reduction processes in soil |
| 3. | **Pedobiology** |  |  |  | Lecture hall |
| 3.1. | Macroflora and microflora in the soil | 3 |  |  |
| 3.2. | Macrofauna and microfauna in the soil |
| 4. | **Soil fertility** | 3 |  |  | Lecture hall |
|  | **Colloquium** | 1 |  |  | Lecture hall |
| **V** | **SOIL CLASSIFICATION** | | | | |
| 1. | **Order of terrestrial soils** |  |  |  |  |
| 1.1. | Class of undeveloped soils | 4 |  |  | Lecture hall |
| 1.2. | Class of humus accumulative soils |
| 1.3. | Class of typical cambic soils |
| 1.4. | Class of residual cambic soils |
| 1.5. | Class of eluvial-iluvial soils |
| 1.5. | Class of anthropogenic and technogenic soils |
| 2. | **Order of semi-terrestrial soils** |  |  |  | Lecture hall |
| 2.1. | Class of pseudogley and stagnogley soils | 2 |  |  |
| 2.2. | Class of anthropogenic semiterrestrial soils |
| 3. | **Order of hydromorphic soils** |  |  |  | Lecture hall |
| 3.1. | Class of undeveloped soils | 4 |  |  |
| 3.2. | Class of semigley soils |
| 3.3. | Class of hypogley soils |
| 3.4. | Class of amphiglaous soils |
| 3.5. | Class of peat soils |
| 3.6. | Class of anthropogenic soils |
| 4. | **Order of halomorphic soils** |  |  |  | Lecture hall |
| 4.1. | Class of acutely saline soils | 3 |  |  |
| 4.2. | Class of acutely alkaline soils |
| 4.3. | Class of acidified halomorphic soils |
| 5. | **Order of subaquatic soils** | 1 |  |  | Lecture hall |
| 5.1. | Class of undeveloped subaquatic soils |  |  |  |
| 5.2. | Class of subaquatic soils |  |  |  |
| 5.3. | Class of anthropogenic subaquatic soils |  |  |  |
| 6. | **The spread of our soils and their production potential** | 2 |  |  | Lecture hall |
|  | **Colloquium** | 1 |  |  | Lecture hall |
| 7. | **Field pedological research** |  | 5 |  | Field |
| 8. | **Physical characteristics of the soil** |  |  |  | laboratory |
| 8.1. | Soil density |  | 2 |  |
| 8.2. | Soil water capacity |  | 1 |  |
| 8.3. | Hygroscopicity |  | 1 |  |
| 8.4. | Inert water, wilting point, physiologically active moisture |
| 8.5. | Current humidity |
| 8.6. | Total porosity |
| 8.7. | Soil capacity for air |
| 8.8. | Mechanical composition |  | 2 |  |
| 8.9. | Plasticity |  | 2 |  |
| 9. | **Chemical characteristics of the soil** |  |  |  | laboratory |
| 9.1. | Alkaline earth carbonates |  | 1 |  |
| 9.2. | Soil reaction |  | 1 |  |
| 9.3. | Potential acidity |  | 2 |  |
| 9.4. | Adsorption complex |  | 2 |  |
| 9.5. | Amount of humus according to Tjurin method, character of humus |  | 2 |  |
| 9.6. | Activated lime |  | 1 |  |
| 10. | **Water balance in the soil** |  |  |  | Lecture hall |
| 10.1. | Water balance according to Thornthwaite |  | 4 |  |
| 11. | **Getting to know soil types** |  | 1 |  | Lecture hall i cabinet |
|  | **Colloquium** |  | 3 |  |
|  | **In total** | **45** | **30** | **0** |  |
|  | **Practical training** | | | | |
| 6. | **Project assignment** |  |  |  | Lecture hall for informatics |
| 6.1. | Introduction |  |  | **8** |
| 6.2. | Physical and chemical characteristics of the soil |
| 6.3. | Water balance according to Thornthwaite |
| 6.4. | Project assignment corrections |

**L=Lectures, E=Excersises, S=Seminars, PT=Practical training**

**Learning outcomes (LO)**

LO 1. Present facts related to the historical development of pedology, pedogenetic factors and processes, and morphological and physiographic features of the soil

LO 2. Rank soils according to the soil classification principles of the Republic of Croatia

LO 3. Recommend land management measures based on analytical data from the laboratory and soil water balance

LO 4. Design tables and graphs and create a report

LO 5. Recommend soil repair measures with the aim of improving agricultural production

LO 6. Present the results of one's own work

Course holder:

Andrija Špoljar, Ph.D., professor of professional studies

Križevci, July 2024