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| Course: 3OAG1O01 | *Chemistry* |
| Number of ECTS:7 |
| Teacher: | Prof. dr Dubravka Štajner, Prof. dr Boris Popović |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures:4 | Practical classes:3 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None/navesti ako ima |
| 1. Educational goal

Providing the basis for the formation of a certain view of the world, getting to know the most important principles, theories and laws of chemistry, providing theoretical basis for acquiring other skills, mastering specific skills related to the application of theoretical knowledge, the development of creative skills and practical skills necessary for the exercise of the profession. |
| 1. Educational outcomes

After completing the course of chemistry, students will train the application of theoretical and practical knowledge of chemistry both in life and in the acquisition of other knowledge (eg, biochemistry, agrochemistry, microbiology, physiology, etc.). In terms of practical knowledge and skills students will be able to compute in chemistry, handling basic laboratory equipment, perform basic volumetric determinations and basic instrumental measurements. In addition to this, students should be able to continue their studies or to apply their knowledge and understanding of the profession and to convey it to others. |
| 1. Course content

Theoretical classes:Introduction. Basic concepts and laws of chemistry. Chemical formulas and equations. Atomic structure and arrangement of electrons in an atom. The structure of atoms and the periodic table of elements. The structure of the molecule. Electron theory of chemical bonding. The main types of inorganic compounds. Intermolecular interactions and states. Basics of thermochemistry, chemical kinetics and chemical equilibrium. The solutions. Electrolytic dissociation and equilibrium in electrolyte solutions. Acids and bases. Hydrolysis and buffers. Oxidation-reduction processes. The redox potential. Colligative properties. Koliodi. Chemical properties of biogenic elements. The most important compounds of biogenic elements and their significance. Structure and classification of organic compounds. Hydrocarbons. Halogen, hydroxy and carbonyl hydrocarbons. Carboxylic acids and carboxylic acid derivatives of biologically important. Amines. Heterocyclic compounds. Carbohydrates. Simple and complex lipids. The peptides and proteins. The nucleic acids. Secondary biomolecules of plants and their significance.Practical teaching: Methods for separation and purification of substances. The stoichiometry. Quantifying the composition of the solution. Electrolytic dissociation and pH. Acid-base titration. Permanganometry. Potentiometric titration. Spectrophotometry. Hydrocarbons and for all their reaction. Chemical reactions of individual groups of organic compounds (alcohol, phenol, carbonyl compounds, carboxylic acids and acid derivatives). Chemical reactions of primary biomolecules. |
| 1. Teaching methods

Theoretical classes and practical exercises. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam (izabrati) | Mandatory | Points |
| Lecture attendance | Yes | 3 | *Theoretical part of the exam/Oral part of the exam/Written part of the exam-tasks and theory* | Yes | 55 |
| Test | Yes | 20 |  |
| Exercise attendance | Yes | 2 |
| colloquium | Yes | 20 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Gorzynski Smith, J. | General, Organic &Biological Chemistry | Published by McGraw-Hill, New York. | 2010. |
|  | Štajner, D., Kevrešan, S. | Chemistry | Faculty of Agriculture, Novi Sad | 2006. |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

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| --- | --- |
| Course: | *Principles of Economics* |
| Course id:3OAG1O02 |
| Number of ECTS:6 |
| Teacher:Exercises: | Radovan V. Pejanović, PhD, full professor, Danica M. Drakulić, PhD, full professorMirela J. Tomaš-Simin, Msc, Teaching Fellow, Danica B. Glavaš-Trbić, MSc, Research Assistant |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 3 | Practical classes: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

Introduce students to the fundamental principles of economic science. The course offers economic concepts, categories, processes and ways of thinking that apply to a modern market economy. |
| 1. Educational outcomes

Selected and key economic issues give students close interpretation of the principals of economic trends, economic developments and economic policy in general. In a theoretical frame and study of the economic concepts in the field of production, distribution and consumption of student acquires the necessary knowledge and guidance for the future economic life. |
| 1. Course content

*Lectures*On the concept and the importance of the economy. The basic components of production. Determinants of production. Enterprises and economic institutions. Economic factors (resources) of production. Specifics of agriculture and capital investment. The basic principles of economics. Principles of economics in agriculture. Markets and market relations. Pricing of goods and factors of production. Households and firms as market participants. The main economic issues and different economic systems. Money and monetary policy. The modern world development trends. Transition. Globalization.*Practical classes*The exercisesare conductedthroughessayswith the active participationof studentsin the discussion.Topicsonexercisesare adaptedcurriculumlectures. Some of the topics: Introductorycategoriesof economicsand basic conceptsof economics, elements andmechanismsof classicalandmoderncapitalist economy, theconcept andhistoryof money, basicproduction unitof social reproduction, market, market participants and market relations, multinational andtransnational companies, Stock Exchange Operations, Crisesin the economy, the causes andconsequences oftransitionandprivatization. Scientific-technical revolution andits impact onthe world economy. |
| 1. Teaching methods

Theoretical and practical lecture are conducted in the classroom. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam  | Mandatory | Points |
| Lecture attendance | Yes | 5 | Oral part of the exam | Yes | 50 |
| Test | Yes | 30 |  |
| Exercise attendance | Yes | 5  |
| Essays | No | 10  |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Pejanović Radovan | Principi ekonomije | Poljoprivredni fakultet, Novi Sad  | 2007 |
|  | Samuelson Pol | Ekonomija | Mate, Zagreb | 2000 |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIESAgroecology and Environmental Protection |
| Table 5.2 Course specification |

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| --- | --- |
| Course: | *Microbiology*  |
| Course id: 3OAG1O03 |
| Number of ECTS:6 |
| Teacher: | Ass. Prof. Simonida Djuric, PhD  |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures:3 | Practical classes:2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

To acquaint students with basic characteristics and strains of microorganisms and their role in the cycling of matter, the creation and maintenance of soil fertility, role in crop production and the possibilities of their application. |
| 1. Educational outcomes

Acquired knowledge in microbiology are the basis for understanding and monitoring teaching of agrochemicals, plant physiology, plant protection, general husbandry, farming, and forage crops |
| 1. Course content

Lectures:General part: Morphology of microorganisms. Ecology of microorganisms, systematic groups – viruses, bacteria, algae, protozoa, fungi, lichen. Microbial metabolism – absorption of nutrients, growth and reproduction, variability of microorganisms. Special part: Soil natural habitat for microorganisms. Diversity of microorganisms in soil. Relationships between microorganisms and between microorganisms, fauna and plants. Formation and composition of organic matter in soil. Microbial transformation of C, N, P, S, K, Fe and Mn. Microorganisms involved in synthesis and mineralization of humus. Effect of agrotechnical measures on microorganisms. Application of microorganisms in plant production. Biofertilizers, biopesticides, biostimants, bioremediation of soil.Practical classes:Microscopic techniques. Morphology and determination of protozoa, algae, fungi and bacteria. Methods for isolations and getting pure culture of microorganisms. Estimation of abundance and determination of microorganisms in soil. Microorganisms involved in cycles of N, C, F and S. Effect of pesticides on microorganisms. Characterization of microorganisms used in biopreparates production |
| 1. Teaching methods

Lectures and Practical classes, Consultations if needed. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam  | Mandatory | Points |
| Lecture attendance | No |  | *Written part of the exam-tasks and theory* *Oral part of the exam* | YesYes | 3040 |
| Test | No |  |  |
| Exercise attendance | Yes | 2 - 10 |
| *Test* | Yes | 20 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Prescott, L. M | Microbiology, 5th edition | 5th edition, McGraw Hill, NY | 2002 |
|  |  | Free Microbiology Books | http://www.wsmicrobiology.com/alcamos-fundamentals-of-microbiology/ | 2014 |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

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| --- | --- |
| Course: | *Meteorology* |
| Course id: 3OAG1O04 |
| Number of ECTS: 6 |
| Teacher: | D.T. Mihailovic |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 3 | Practical classes: 2 | Other teaching types: 0 | Study research work: 0 | Other classes: 0 |
| Precondition courses | None |
| 1. Educational goal

The course aims to provide students with the basic concepts to understand the physical characteristics of the Earth's atmosphere and how these properties affect fundamental processes of importance to agriculture.  |
| 1. Educational outcomes

The course is designed to provied fundamental information to enable students to have reasonable understanding of meteorological problems related to agriculture and to extrapolated this knowledge to new situations related to organisation of agricultural production from farm to regional level. |
| 1. Course content

LecturesPart I: Physical background1. Introduction. Short description of meteorology. Meteorological elements. Weather and climate. Organization of weather observation (2). 2. The composition of the atmosphere. Origin and the physical structure of the atmosphere. Atmospheric density and pressure - vertical profile (3). 3. The Atmosphere and Earth radiation fluxes. Global radiation. Earth and atmospheric longwave radiation. Atmospheric UV radiation. Soil and water energy balance. Energy balance of the Atmosphere. Atmospheric pressure (8). 4. Atmospheric water. Evaporation. Evapotranspiration. Condensation and sublimation of water vapor in the atmosphere. Cloud precipitation. (8). 5. Atmospheric circulation. Wind. Fronts and cyclones. Local winds. General atmospheric circulation (5).Part II: Impact of climate and weather on plants6. About climate. Climate elements and factors. Climate classification (4). 7. Climate change. Climate change impact on agriculture. Natural and anthropogenic causes of climate change. Recent climate change trends. Potential climate change impact on agriculture (4). 8. Selected chapters of agrometeorology. Role of agrometeorology. Impact of weather and climate on plants. Impact of weather and climate on pest and disease developments. Adverse weather conditions in agriculture - forecasting and protection. Agrometeorological analysis and forecasting (7).Practical classes: CalculusIntroduction. Weather observation and data management (2). Duration of shortwave radiation-measurement and calculation (2). Intensity of shortwave and longwave radiation-measurement and calculation (2). Atmospheric humidity-measurement and calculation (2). Evaporation-measurement and calculation (2). Transpiration-measurement and calculation (2). Precipitation - measurement and calculation (2). Soil temperature - measurement and calculation (2). Air temperature measurement. Sum of active temperatures - methods of calculation (2). Effective sums of air temperature. Calculation of acummulated dagree-days and degree-hours (2). Drought. Calculation of hydrothermic coefficient of Selyaninov (2). Radiation frost forecasting (2). Forecasting meteorological conditions for plant disease and pests appereance (2). New techniques in weather data measurements and analysis (2). |
| 1. Teaching methods

Lectures,Practical classes/Calculus, Consultations |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam (izabrati) | Mandatory | Points |
| Lecture attendance | Yes | 0 | *Written part of the exam-tasks and theory* | Yes | 50 |
| Test - lectures | No | 30 |  |
| Exercise attendance | Yes | 0 |
| Test - exercise | Yes | 20 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Milosavljevic M. | Climatology | Scientific book | 1963 |
|  | Milosavljevic M. | Meteorology | Scientific book | 1967 |
|  | Mihailovic, D.T., Lalić, B., Arsenić, I. | Meteorological observations and data management | Faculty of Agriculture | 2008 |

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| --- | --- |
| Course: | *Sociology* |
| Course id:3OAG2O05 |
| Number of ECTS: 4 |
| Teacher: | Assistant professor: Dejan R. Janković, Ph.D.Assitants: M.Sci. Marica D. Petrović, M.A. Marina D. Novakov |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 2 | Practical classes: 1 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

The sociology course will introduce students to the basictheoreticaland methodological standpoints in relation toagriculture and rural areas, social changes thataffectrural areas, as well asthe interaction betweenrural and urbansocial phenomena. Changesof traditionalsocial structuresandpatterns of behaviourare the starting pointfor the analysisof social change of peasantry and rural areas, agriculture andits functions, as well asvarious functions andtransformationsof social groupsandinstitutions in the processof rural development. |
| 1. Educational outcomes

This course will provide students with: knowledge of the basic sociological categories and methods of research in (rural) sociology; ability to analyze social phenomena in terms of social (agrarian and rural) structure and social relations; understanding of the basic principles of traditional peasant economy and transformation of traditional structures in relation to social groups, institutions, cultural patterns; understanding of complexity of rural development process. |
| 1. Course content

Meaning and tasksof the sociology as a discipline. Development of sociology andrural sociology. Methodsin (rural) sociology. Basictheoretical andmethodological approachesin rural sociology. Meaning, dimensions andelementsof social structure. Meaning and typesof social change. Globaldevelopment processesasagents of change of agrarian and rural structures.Ecological problems ofagriculture and rural areas. Peasant economyandchanges inthe agrarian structure. The oldagrarianrelations in Europe and Balkans and recentchanges inthe agrarian structure in Balkans. Family farms and features of rural areas in Serbia in present time. Rural settlementsand rural population. Rural development and rural policy. The peasantryas asocial classandas a political-historical factor. The social organization oflocalrural communities. Social groupsin rural areas.Socialinstitutions and organizationsin rural areas. Rural culture-between traditionandinnovation. Diffusion ofinnovation in agriculture and rural areas. |
| 1. Teaching methods: Lectures, Discussions, Group work, Research work, Consultations
 |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 10 | *Theoretical part of the exam/Oral part of the exam/Written part of the exam-tasks and theory* | Yes | 30 |
| Test | Yes | 40 |  |
| Exercise attendance | Yes | 10 |
| *Term paper and students’ involvement in classroom activities* | Yes | 5 + 5 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Шљукић, С и М. Шљукић | Земља и људи. Сељаштво и друштвена структура. | Mediterran Publishing. Нови Сад | 2012 |
|  | СтојановМ | Социологијасеоскихколектива. | Матицасрпска. Нови Сад | 2004 |
|  | Митровић, М.  | Социологија села | СДС. Београд | 1998 |
|  | M. Haralambos i M. Holborn.  | Sociologija: teme i perspektive;Internet sources; scientific journals | Golden marketing. Zagreb | 2002 |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecologyandenvironmental protection** |
| Table 5.2 Course specification |

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| --- | --- |
| Course: | *Botany* |
| Course id: ЗOAG2О06 |
| Number of ECTS: 7 |
| Teacher: | Branka Ljevnaić-Mašić, Ph.D., Dejana Džigurski, Ph.D |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 4 | Practical classes: 3  | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

Acquiring the necessary knowledge concerning the structure of plants, their function, the systematics of plants with emphasis on taxa relevant for students of Agroecology and Environment Protection, as well as the relationships of plants to environmental conditions, which is a prerequisite for the proper and successful cultivation of plants. |
| 1. Educational outcomes

The knowledge obtained within the course of Botany is the basis for the study of other fundamental and applied scientific disciplines, as well as the basis for a proper understanding of plants and their use for human needs. |
| 1. Course content

*Lectures*:Organization of wildlife and the basic characteristics of life. Botany and Agronomy.Plant cell, plant cell components: protoplasm, products of protoplasmic activity, cytoplasmic organelles. Autotrophic based diet. The morphology and anatomy of cormus.Metamorphosis of vegetative organs. Reproduction of plants. Flower, blossom, flowering, pollination, fertilization. Seed. Fruit. Taxonomic categories and their hierarchies.Classification of vascular macrophytes. Phytoecology. Autecology. Synecology. Practical classes:Exercise, Other modes of teaching, Study researchThe microscope and microscopic techniques. Plant cells. Cytoplasmic membranes. The cell organelles. Products of protoplasmic activity. Meristematic tissues. Premanent tissues.Anatomical structure of vegetative organs. Systematics ofcormophytes. Field exercise. |
| 1. Teaching methods

Lectures - verbal-textual and illustrative demonstrative methodsPractical classes - management of students’ individual work and demonstrative-illustrative methods |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 0-5 | *Oral part of the exam* | Yes | 0-50 |
| Exercise attendance | Yes | 0-5 |  |  |  |
| Colloquium | Yes | 0-10 |  |
| Term paper | Yes | 0-5 |
| Tests | Yes | 0-20 |
| Herbarium | Yes | 0-5 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
| 1. | Glimm-Lacy Janice and Kaufman B. Peter | Botany Illustrated – Introduction to Plants, Major Groups, Flowering Plants Families, second edition | Springer | 2006 |
| 2. | Kojić M., Pekić S., Dajić Z. | Botanika | Romanov, Banja Luka | 2003 |
| 3. | Janjatović, V. | Botanika | Naučna knjiga, Beograd | 1994 |
| 4. | Knežević, A., Stojanović, S., Lazić, D. | Botanika – udžbenik za praktičnu nastavu | Poljoprivredni fakultet, Univerzitet u Novom Sadu | 2007 |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecologyandenvironmental protection** |
| Table 5.2 Course specification |

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| --- | --- |
| Course: | *Soil Science* |
| Course ID:3ОAG2О07 |
| Number of ECTS: 6 |
| Teacher: | Milivoj Dj. Belic PhD, full professor; Ljiljana M. Nesic PhD, associate professor; Vladimir I. Ciric PhD, assistant professor |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 4 | Practical classes: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

This course is designed to introduce students with properties of soil, processes of genesis, evolution, causes of variability and laws of geographical distribution of land cover, as well as classification of soil.  |
| 1. Educational outcomes

After passing this course, students will expand knowledge of soil science that will allow them to understand problems related to soil in intensive agriculture. |
| 1. Course content

*Theoretical lectures*: Introduction lecture, Minerals and rocks as a material for soil forming, Morphological properties of soil, Physical properties of soil, Chemical properties of soil, Soil as a dispersion system, Mechanical composition of soil, Clay, Organic matter, Soil colloids, Organo-mineral complex, Porosity, Water and water properties of soil, Heat and thermal properties of soil, Air and air conditions of soil, Elements that are part of pedosphere, Sorption capacity, Soil solution, Reaction (pH), Acidity and alkalinity of soil, Buffer capacity and oxidation-reduction potential, Biological properties of soil, Genesis of soil, Systematisation and classification of soil*Practical lectures*: Primary– petrogene and secondary minerals, Igneous rocks, Sedimentary rocks, Metamorphic rocks, Field research of soil, Soil density, Mechanical composition of soil, Water permeability and capillary rise, Soil plasticity, Determination of humus in soil, Determination of CaCO3, Determination of active soil acidity, Determination of potential soil acidity and required amount of lime agent for improvement of acidic soils, Determination of characteristic of adsorption complex, Determination of easily soluble salts in soil and required amount of gypsum for improvement of alkaline soils *Field work*:Introduction of different parent materials and profiles of the most common soil types in Vojvodina. |
| 1. Teaching methods

Lectures, Practice/ Practical classes, Consultations, study |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam  | Mandatory | Points |
| Lecture attendance | Yes | 5 | *Written part of the exam/Oral part of the exam* | Yes | 60 |
| Test | Yes | 20 |  |
| Exercise attendance | Yes | 5 |
| Colloquium | Yes | 10 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | A. Kukin, V. Hadžić, Lj. Nešić, M. Belić | Agrogeologija | Poljoprivredni fakultet, Novi Sad | 2007 |
|  | Nikola Miljković | Osnovi Pedologije | Prirodno-matematički fakultet, Novi Sad | 1996 |
|  | Nikola Miljković | Meliorativna Pedologija | Poljoprivredni fakultet, Novi Sad | 2005 |
|  | Miodrag Živković, Aleksandar Đorđević | Pedologija I: geneza, sastav i osobine zemljišta | Poljoprivredni fakultet,Beograd | 2003 |
|  | M. Belić, Lj. Nešić,V. Ćirić | Praktikum iz pedologije | Poljoprivredni fakultet Novi Sad | 2014 |
|  | H. Resulović, H. Čustović | Pedologija- Opći dio (Knjiga 1) | Univerzitet u Sarajevu, Sarajevo | 2002 |
|  | G.J. Dugalić, B.A. Gajić | Pedologija | Univerzitet u Kragujevcu, Agronomski fakultet u Čačku | 2012 |
|  | Robert E. White | Principles and practice of soil science | Blackwell publishing | 2006 |
|  | M.R. Ashman, G. Puri | Essential soil science | Blackwell publishing | 2006 |

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| Course: 3OAG2O08 | *Plant Biochemistry* |
| Course id:*različit na svakom smeru* |
| Number of ECTS: 6 |
| Teacher: | Prof. dr Đorđe Malenčić |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 3 | Practical classes: 3 | Other teaching types: student`s papers (seminar) | Study research work: yes | Other classes: - |
| Precondition courses | None |
| 1. Educational goal

To gain knowledge on molecular aspects of biochemical processes and interactions in plants. Study on primary and secondary biomolecules in plants and their metabolism.  |
| 1. Educational outcomes

The contribution ofnew knowledgein the field ofPlant biochemistry. |
| 1. Course content

Theory: Chemical composition of plant organs and tissues. Primary biomolecules – properties, structures and function in plants (amino acids, peptides and proteins, enzymes, coenzymes, vitamines, phytohormones, carbohydrates, lipids and nucleic acids).Metabolism of primary biomolecules and bioenergetics (metabolism of amino acids and proteins, metabolism of carbohydrates, lipids and nucleic acids). Plant membranes and transport of metabolites. Respiratory electron-transport chain and oxidative phosphorilation. Secondary biomolecules - properties, structures, function and metabolism in plants. Practical classes: Proteins (qualitative reactions, determination of isoelectrical point of amino acids and proteins); Enzymes (effect of temperature, pH, substrate and enzyme concentration on enzyme activity, kinetics of enzyme reactions, antioxidant enzymes activity);Carbohydrates (qualitative reactions, determination of aldoses in plant material); Оrganic acids (determination of total acidity in apple fruit); Lipids (detemination of saponification and iodine number of plant oils); Vitamins and provitamins(determination of vitamin C in kiwi and paprika fruits, and carotenoids in carrot roots);Isolation of essential oils from plant herba and separation of compounds using thin-layer chromatography, TLC); Glycolysis and alcoholic fermentation. |
| 1. Teaching methods

Lectures, Practical classes, Consultations, research work (optional) |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 5 | Oral part of the exam-tasks and theory | Yes | 60 |
| Exercise attendance | Yes | 5 |  |
| Test, Term paper | Yes | 30 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Dr Milan Popović | Biohemija biljaka(Plant biochemistry) | Poljoprivredni fakultet, Novi Sad(Faculty of agriculture, Novi Sad) | 2008. |
|  | Dr Đorđe Malenčić, dr Milan Popović | Praktikum iz Biohemije biljaka (Plant biochemistry handbook) | Poljoprivredni fakultet, Novi Sad(Faculty of agriculture, Novi Sad) | 2011. |
|  | P.M. Dey & J.B. Harborne | Plant biochemistry | Academic Press, London | 1997. |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecologyandenvironmental protection** |
| Table 5.2 Course specification |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

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| --- | --- |
| Course: | *Agroecology* |
| Course id:3ОAG3О09 |
| Number of ECTS: 6 |
| Teacher: | Prof. dr Dragiša MIlošev, Doc. dr Srđan Šeremešić |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures:3 | Practical classes:2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None/navesti ako ima |
| 1. Educational goal

The aim of this subject is to introduce students with the components of the agroecosystem and their interactions. Knowledge gained in this course will allow students to understand the natural processes which underlie the practices of crop production and determine the formation and pathways of the primary organic matter flow in the agroecosytems. |
| 1. Educational outcomes

Students should learn to identify the specific elements of the agroecosystems, understand their role, which will enable them to analyze and understand the problems that can arise in the process of food production. By attending this subject student will gain knowledge how to efficiently manage cropping system to achieve sustainability in the semi-arid environment.  |
| 1. Course content

Crop production as a part of the agricultural production. The aim of Agroecology, agriculture in light of Agroecology. Production of organic matter and the factors that influence its formation. Biosphere, agrosphere, agricultural biotopes, agrobiocenosis, biological balance, development of agro-biocenosis. The vegetative factors, function, ecological valence, amplitude of crop adjustment. Climate as a factor of crop growth, leaf area, day length, photoperiodism. The effect of temperature on the growth and development of plants, the cardinal temperature points, net primary productivity, agricultural assessment of climate. Water as an ecological and productive factor, the air humidity, the occurrence of drought. Land vegetation as a factor, anthropogenic soil, the balance of humus in soil, porosity, buffering capacity of the soil, chemical and biological properties of the soil, soil structure. Crop as a factor of production, man as a factor of production, physiographic factors. Agricultural zoning of Serbia and Vojvodina. Laws of yield formation.*Practical classes*:The sunlight as a vegetation factor. Heat as vegetation factor, calculation of the mean daily temperature, effective temperature, temperature sum, vernalization. Water as a factor of vegetation, water balance in crop production, calculation of the air-dry crop yield. Agricultural evaluation of the climate, climatograms. Soil vegetation as a factor. Anthropogenic soil. Soil quality. Agricultural zoning. |
| 1. Teaching methods

Lectures, Practical classes, Consultations and Seminars.  |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | No | 5 | Oral part of the exam | Yes | 45 |
| Test | No | 20 |  |
| Exercise attendance | Yes |  |
| *Practical classes oral exam*  | Yes | 30 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Miguel Altieri | Agroecology: The Science of Sustainable Agriculture | Westview Press | 1995 |
|  | Stefan R. Gliessman | Agroecology: ecological processes in sustainable agriculture | CRC Press | 1997 |
|  | Frencis C. et al. | Agroecology: The Ecology of Food Systems | Jurnal of Sustainable Agriculture | 2003 |
|  | Adel El Titi | Soil Tillage in Agroecosystems | CRC Press | 2002 |
|  | Dragiša Milošev, Srđan Šeremešić | Agroecology (Handbook) | Faculty of Agriculture, UNS | 2010 |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

|  |  |
| --- | --- |
| Course: | ***Principles of Ecology*** |
| Course id: 3ОAG3О10 |
| Number of ECTS: 6 |
| Teacher: | Pero Štrbac, PhD; Branka Ljevnaić-Mašić, PhD; Dejana Džigurski, PhD; Aleksandra Konjević, MSc. |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 3 | Practical classes: 2  | Other teaching types: 2 | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

Introducing students to the basic principles of ecology, ecological concepts and structures. Teaching students andpreparing them for evaluation of interactive influence of abiotic and biotic factors on population, biocenosis and ecosystem. |
| 1. Educational outcomes

Theoretical and practical knowledge of the basics of ecology, ecological principles and concepts.Self-assessment and use of interactive influence of abiotic and biotic factors indifferent ecological structure.Knowing the characteristics of the population and their application in environmental protection. |
| 1. Course content

*Lectures*:Relations between organism and environment. The definition of ecology. The concept of the biosphere. The term of ecosystem. The concept and the effect of environmental factors. The ecological valence. The complex of factors and the Law of the minimum. Habitats and the concept of biotopes. Life form. The ecological niche. Climatic factors. Soil. The biotic factors. Population ecology. Ecology of environmental community. Ecology of ecosystems. The position of man in the biosphere and anthropogenic factor. Environmental areas: Area of seas and oceans. The area of inland waters. Terrestrial area of life. Regions, subregions and the provinces. The overall importance of solar radiation for the plants and vegetation. Types of plants in relation to the light. The importance of temperature for the life of plants and their geographical distribution. The relation of plants to water. Environmental groups of plants as compared to water. The effect of air and wind plants. The importance of soil for plants and ecophysiological characteristics of plants in habitats with different conditions of land. The influence of other organisms on plants. Phytocoenology.*Practical classes*:Examples of abiotic factorsand biotic factors. Methods of calculating population density. Age structure of the population.Determination of age and the length growth of fish. Mortality and tables of mortality. Population growth, the tables of growth and survival of the population. The spatial distribution. Zoogeography: Regions, subregions and the provinces. Taxonomic analysis of flora. The biological spectrum and phytogeographical analysis of flora. Categorization of weed species according to their habitat. Ecological analysis of flora. The basic concepts of phytocenology- creating phytosociological table. Creating synthetic phytosociological tables and calculating the index of similarity according to Sorensen. Synmorphologyand synecology of analyzed association. |
| 1. Teaching methods

The method of oral presentations and discussions. Method of presentations, demonstrations and illustrations on the board and using the computer. Practical laboratory and experimental methods. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 0-5 | *Written part of the exam-tasks and theory* | Yes | 12-30 |
| Exercise attendance | Yes | 0-5 | *Oral part of the exam* | Yes | 20-30 |
| Test | Yes | 16-30 |  |
| Term paper | Yes | 6-10 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Štrbac, P. | Biologija-Zoologija sa ekologijom | Megatrend, Beograd | 2003 |
|  | Đukić, N., Maletin, S. | Poljoprivredna zoologija sa ekologijom II–Zooekologija | Poljoprivredni fakultet Novi Sad | 1998 |
|  | Štrbac, P., Popović, A., Konjević, A. | Osnovni principi ekologije životinja | Poljoprivredni fakultet, Novi Sad | 2011 |
|  | Schulze E.D.et al.. | Plant Ecology | Springer | 2002 |
|  | Chapin S. et al. | Principles of Terrestrial Ecosystem Ecology | Springer | 2002 |
|  | Stevanović B., Janković M. | Ekologija biljaka sa osnovama fiziološke ekologije biljaka | NNK International, Beograd | 2001 |
|  | Janković M. | Fitoekologija s osnovama fitocenologije i pregledom tipova vegetacije na Zemlji | Naučna knjiga, Beograd | 1990 |

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| Course: | *Soil Fertility and Fertilizers* |
| Course id:3OAG3O11 |
| Number of ECTS: 6 |
| Teacher: | Prof. dr Darinka M. Bogdanović, mr Ranko R. Čabilovski |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures:3 | Practical classes:2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None/navesti ako ima |
| 1. Educational goal

The acquisition of basic knowledge of soil fertility and fertilizer application. |
| 1. Educational outcomes

The student is qualified for further education through master's and PhD studies. Students will also be able apply the acquired knowledge, about soil fertility and fertilizer application, in agricultural practice.  |
| 1. Course content

***Theoretical instruction***Subject *SOIL FERTILITY AND FERTILIZERS*consists of several thematic units: Nitrogen in the soil. Phosphorus in the soil. Potassium in the soil. Other essential microelements. Useful elements. Microelements in the soil. Heavy metals in the soil. Soil properties and processes related to plant nutrition and fertilizer application. Fertilizers. Nitrogen fertilizers. Phosphorus fertilizers. Potassium fertilizers. The complex fertilizers.Organo-mineral fertilizers. Liquid fertilizers. Fertilizers with pesticides and trace elements. Organic fertilizers. Principles of fertilization. The control system of soil fertility and fertilizer application ***Practical instruction***Laboratory exercise: Soil fertility. Determining the need for fertilization. The system of soil fertility control and fertilizer application. Soil sampling. Determination of total nitrogen in the soil. Determination of mineral nitrogen in the soil. N-min method. Phosphorus in the soil. Potassium in the soil. Trace elements in soil. Field trials. Basic physical and chemical properties of fertilizers. Regulation of fertilizers and soil improvers. Principles for determining the dose of fertilizer application.***Field exercises:***Visit the experimental field of Institute of field and vegetable crops. . Visit the factory of mineral fertilizers. |
| 1. Teaching methods

Lectures and Practical classes |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam (izabrati) | Mandatory | Points |
| Lecture attendance | Yes | 0 | *Oral part of the exam* | Yes | 30-70 |
| Tests | Yes | 30+30=60 |  |
| Exercise attendance | Yes | 0 |
| Colloquium | Yes/No | 6-10 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Ubavić, M., Bogdanović, D.: | Agrohemija | Poljoprivredni fakultet, Novi Sad | 2001. |
|  | Jakovljević, M., Pantović, M. | Hemija zemljišta i vode. | Poljoprivredni fakultet, Zemun, Beograd | 1991. |
|  | Ubavić, M., Bogdanović, D. | Praktikum iz agrohemija | Poljoprivredni fakultet, Novi Sad | 1995. |
|  | Westerman R.L. | Soil testing and plant analysis, SSSA Book series 3 | Madison, USA, | 1990 |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

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| Description: Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Description: Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

|  |  |
| --- | --- |
| Course: | *Plant Physiology* |
| Course id:3OAG3O12 |
| Number of ECTS: 5 |
| Teacher: | Ivana V. Maksimović; Marina I. Putnik- Delić |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 3 | Practical classes:3 | Other teaching types  | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

The aim of the course is to provide students with knowledge about the functioning of the organism of higher plants, as well as on the impact of environmental factors on physiological processes. Also, students will learn how and to what extent certain physiological processes can be controlled, which is important for agricultural production. |
| 1. Educational outcomes

The outcome is knowledge about physiological processes in higher plants and abiotic and biotic factors affecting them, with the aim to apply this knowledge in practice.  |
| 1. Course content

LecturesPhysiology of plant cells: types, structure, compartimentality. Biomembranes. Organelles, microbodies, cytoskeleton.Chemical and physical properties of plant cells. Tissue culture or cells. Water regime: features, uptake, transport and transpiration. Factors affecting water regime. Plant water requirements, the impact of the lack of water, mineral nutrition: Content, classification andphysiological role of essential and useful elements in plants. Mechanism of the uptake and transport of mineral nutrients and organic compounds. Mineral nutrition and yield. Photosynthesis: importance, photosynthetic pigments, absorption and transformation of light. Photophosphorilation. C3, C4 and CAM photosynthetic paths. Photorespiration.Transport of assimilates. Photosynthesis and yield. Respiration: Glycolysis, Krebs cycle, oxidative phosphorylation,energy balance. Alternative pathways and ecology of respiration, growth and differentiation: phytohormones, cell growth and development. Biological rhythms, differentiation, correlations, abscission, senescence and death.Seed physiology: Pollen, pollination, fertilization. Regulation of seed and fruit development. Seed germination and factors affecting it. Practical workContents of practical work accompanies lectures (Physiology of the cell, water regime, mineral nutrition, photosynthesis, respiration and enzymes, growth and development) |
| 1. Teaching methods: Lectures
 |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam (izabrati) | Mandatory | Points |
| Written entrance-exam | Yes | 20 | *Theoretical part of the exam/Oral part of the exam* | Yes | 40 |
| Test | No | 2x15 |  |
| Exercise attendance | Yes |  |
| *Term paper* | No | 10 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Kastori R, Maksimović I | Ishrana biljaka | Vojvođanska akademija nauka | 2008 |
|  | Maksimović I, Pajević S. | Praktikum iz fiziologija biljaka | Poljoprivredni fakultet i Prirodno-matematički fakultet, Novi Sad | 2002 |
|  | Lincoln Taiz and Eduardo Zeiger | Plant Physiology, Fifth Edition | Sinauer Associates | 2010 |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

|  |  |
| --- | --- |
| Course: | *Soil Protection* |
| Course id: 3ОAG4О13 |
| Number of ECTS: 6 |
| Teacher: | Ljiljana Nesic, PhD, associated professor; Lazar Savin, PhD, associated professor; Vladimir Ciric, PhD, assistant professor; Mirko Simikic, PhD, assistant professor |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 4 | Practical classes: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | Soil science |
| 1. **Educational goal** of the course is to acquire knowledge about soil as a natural resource, ameliorative aspects of soil classification of Serbia, types of soil degradation under the influence of technological development and measures for its protection. In addition, students should be able to be theoretical and practical mastery of the essential parameters for soil, with the basic construction of tractors, mobile systems and machinery and its impact on soil degradation.
 |
| 1. **Educational outcomes** of the course are education and training of students for work in the field of soil degradation, application of methods for rehabilitation and remediation, as well as qualifications for the selection, planning, management and exploitation of modern mechanization for agricultural production as well as for environmental protection.
 |
| 1. Course content:

*Theory lessons:* The soil as a natural resource. The basic functions of land. Types of degradation: Degradation of taking away (erosion) of land. Soil degradation impairment in-situ (degradation of chemical, physical and biological processes in the soil). Ameliorative aspects of soil classification. Global environmental change and soil degradation. The impact of agricultural production on the soil. Contamination of soil fertilizers, heavy metals, radionuclides, pesticides. Technology for protection various forms of soil degradation. Remediation and recultivation of contaminated and degraded soil.Basics of tractors and mobile systems. Methods for soil tillage. Machines for seeding. Methods and machinery for controling weeds. Manipulation with manure and fertilization. The protection of agricultural land. Harvesting crops. Soil compaction as a result of poor choices and uncontrolled uses of tractors and mobile systems. Precision agriculture and GPS.*Practical teaching, Exercises, Research study work, Field research soil, Laboratory tests:* active and potential acidity of soil, salinity and alkalinity of soil. Fractionation of organic matter in the soil. Methods for determination of heavy metals. Parameters related to the assessment of soil contamination. Introduction with the structure of tractors and mobile systems. Introducing the purpose of the basic parts, work principle, with machines for classical and conservation soil, fertilization, seeding, spraying and harvesting crops. Introduction with equipment for testing soil compaction and soil compaction testing under field conditions. |
| 1. Teaching methods

Lectures, Practice/ Practical classes, Consultations, Study |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam  | Mandatory | Points |
| Lecture attendance | Yes | 5 | *Oral part of the exam* | Yes | 30 |
| Tests | Yes | 30 |  |
| Exercise attendance | Yes | 5 |
| Colloquium | Yes | 15 |
| Seminar paper | Yes | 15 |  |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Vučić N. | Higijena zemljišta | Vojvođanska akademija nauka i umetnosti, Novi Sad | 1992 |
|  | Sekulić P., i sar. | Zaštita zemljišta od degradacije | Naučni institut za ratarstvo i povrtarstvo Novi Sad | 2003 |
|  | Miljković N.: | Meliorativna pedologija | Poljoprivredni fakultet Novi Sad | 2005 |
|  | Nikolić R. i sar. | Istraživanje uzroka, posledica i mera za smanjenje i kontrolu sabijanja zemljišta | Poljoprivredni fakultet, Novi Sad | 2002 |
|  | SavinL.isar. | Traktori – konstrukcijeiprincipirada (upripremi) | Poljoprivrednifakultet, NoviSad |  |
|  | M. Belić, Lj. Nešić,V. Ćirić | Praktikum iz pedologije | Poljoprivredni fakultet Novi Sad | 2014 |
|  | Marta Birkas | Environmentally sound adaptable tillage | Akademia Kiado, Budapest | 2008 |
|  | Robert E. White | Principles and Practice of Soil Science | Blackwell publishing, Fourth edition | 2006 |
|  | M. Belić, Lj. Nešić,V. Ćirić | Praktikum iz pedologije | Poljoprivredni fakultet Novi Sad | 2014 |

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| Course: | *Sustainable Agriculture* |
| Course id:3ОAG4О14 |
| Number of ECTS: 5 |
| Teacher: | Prof. dr Maja Manojlović, Doc. dr Srđan Šeremešić, Msc Klara Marijanušić |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures:3 | Practical classes:2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

The aim of this subject is explain the ecological trends in modern agriculture intended for production of safe food with the least impact on the environment.  |
| 1. Educational outcomes

Student should demonstrate the understanding of ecological dimension in crop production and to recognize the management practice that favors the sustainable development of the agroecosystem.  |
| 1. Course content

Introduction to sustainable agriculture. Interaction of sustainable agriculture and other systems of crop production. The importance of sustainable agriculture - agronomical, environmental, economic and social aspects. Legislation in organic agriculture. Management practices and their impact on the environment (soil, water, air). Tillage systems and their adjustments to the goals of sustainable agriculture. Importance of crop rotation and the basic principles for crop rotation introduction, preparation and evaluation. Importance of intercropping in sustainable agriculture. Knowledge, cultivation and uses of intercrops. Crop needs for fertilization. Nutrients cycles and anticipated losses of nutrients. Sources of nutrients for crops. The importance of organic and microbiological fertilizers. Introduction to balanced fertilization. Fertilization and environmental protection. Biological methods in crop protection. Buffer zones and strips, biodiversity in agroesystems.*Practical classes*: Visiting farms with different production systems (conventional, integrated, organic), introduction to applied management systems, evaluation and suggestions for improvement.  |
| 1. Teaching methods

Lectures, Practical classes, Consultations and Seminar papers.  |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 10 | Oral part of the exam | Yes | 40 |
| Test | Yes | 30 |  |
| Exercise attendance | Yes | - |
| Practical classes oral exam  | Yes | 20 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Altieri, M. | Agroecology: The Science Of Sustainable Agriculture, Second Edition | Westview Press | 1995 |
|  | Lichtfouse, E., Navarrete, M., Debaeke, P., et al. | Sustainable Agriculture | Springer | 2009 |
|  | Adel El Titi | Soil Tillage in Agroecosystems | CRC Press | 2002 |
|  | Maja Manojlović (editor) | Đubrenje u održivoj poljoprivredi | Faculty of Agriculture, University of Novi Sad | 2008 |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecologyandenvironmental protection** |
| Table 5.2 Course specification |

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| --- | --- |
| Course: | *Weeds in the Urban Environment* |
| Course id: 3OAG4O15 |
| Number of ECTS: 5 |
| Teacher: | Branko I. Konstantinović, Milena M. Popov |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 4 | Practical classes: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None/navesti ako ima |
| 1. Educational goal

Knowledge acquisition about biology and ecology of weed species in the urban environment and the possibility of their extinction. |
| 1. Educational outcomes

The students who have passed the subject Weeds in the Urban Environment will have the basic knowledge about weed species in the urban environment and the damage they cause to humans and environment.  |
| 1. Course content

Theoretical classes: The notion, definition and division of weeds. Propagation of weed. Dormancy of seeds and „the bank“ of seeds in the soil. Characteristics of the soil and weeds. Allelopathy. Medical and poisonous plants. Synecology of weeds. Phytocenology. Antropogenic plant communities. Classification of measures of weed control. Significance of the integral measures of weed control. Indirect measures of weed control. Direct measures of weed control. Mechanical control measures. Biological weed control. Weed control by the application of herbicides. The contents and distribution of herbicides. Periods of the intervention with herbicides. Mode of action of herbicides. Persistence of herbicides. Phenomenon of resistance and anti-resistance strategy. Herbicides, soil and the phenomenon of degradation. Microbiological components as potential herbicides. Development of genetical engineering to create plants resistant to herbicide. Weed control on ruderal surfaces.Weed control in water. Weed control on railways and embankments.Practical classes - Exercises: The exercises include training for recognition and determination of the taxonomy of the weed species in urban areas, using the keys to their determination. Familiarizing with the taxonomy, morphology and biology of weed species. Determination of seed and seedling of weed species. Methods of studying weed species and weed flora. Sorting out the phytocenological tables and establishing the syntaxonomical belonging of weed phytocenoses. |
| 1. Teaching methods

Lectures, consultations, study, research work. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam (izabrati) | Mandatory | Points |
| Lecture attendance | Yes/No | 10 | Oral part of the exam | Yes | 40 |
| Test | Yes/No | 20 |  |
| Exercise attendance | Yes/No | 10 |
| Seminarpapers | Yes/No | 20 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Konstantinović B., Bošković,J. | Biotehnologija u zaštiti bilja. | Univerzitet u Novom Sadu, Poljoprivredni fakultet | 2001 |
|  | Konstanović, B., Stojanović, S., Meseldžija M. | Biologija, ekologija i suzbijanje korova | Univerzitet u Novom Sadu, Poljoprivredni fakultet | 2005 |
|  | Konstanović, B. | Korovi i njihovo suzbijanje | Univerzitet u Novom Sadu, Poljoprivredni fakultet | 2008 |
|  | Konstanović, B. | Osnovi herbologije i herbicidi | Univerzitet u Novom Sadu, Poljoprivredni fakultet | 2011 |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

|  |  |
| --- | --- |
| Course: | *Animal production* |
| Course id:3ОAG4О16 |
| Number of ECTS: 5 |
| Teacher: | Prof.dr Niko Milošević, Prof.dr Mirjana Đukić Stojčić |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 4 | Practical classes: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

Introduce students to the biological basis of domestic animals (cattle, pigs, sheep and poultry) and characteristic animal production in order to observe the conditionality of animal and crop production. Upon completion of the course animal husbandry,educated professionals who will have a basic knowledge of animal production and the importance of crop production in the cultivation, nutrition, reproduction and use of production potential of domestic animals. |
| 1. Educational outcomes

Training experts with academic qualifications, who are trained to be based on the basic knowledge in the field animal production, with special practical and scientific preparation, engage in professional activities in the provision of primary conditions (fodder production) for the breeding of domestic animals. The knowledge gained academic bachelor's degree gives academics professional competency and skills of application of general knowledge for successful cultivation of certain types of livestock and livestock production food.  |
| 1. Course content

LecturesThe importance of animal production in agricultural business will be taught in the course. The biological concept of species and breeds of domestic animals. The principles of propagation and increase domestic animals. Basic concepts of breeding domestic animals. Breeding systems and preventative measures to protect domestic animals. Nutrients and nutrition of farm animals.Zoological characteristics especially cattle, pigs, poultry and sheep. Specifics of types and breeds of domestic animals asspecific biological species. Specifics of propagation of each species of domestic animals. The technology of growing domesticanimals per species. Specificity of the nutrition of farm animals by species. Facilities and equipment in livestock (cattle,pig, poultry and sheep farming).Practical classesDomestication and its impact on the physiological, production and exterior changes in domestic animals. Time and reasonsdomestication of animals. The origin, the concept of race and racial traits in domestic animals. The influence of external factorsenvironment on the animal organism. Constitution, fitness and exterior of domestic animals. The selection and testing of production capacity of domestic animals. Cattle, pig, poultry, sheep production.  |
| 1. Teaching methods

Lectures, Practical classes, Consultations, research work. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam (izabrati) | Mandatory | Points |
| Lecture attendance | Yes | 5 | *Oral part of the exam and**written part of the exam-* | Yes | 50 |
| Test | Yes | 40 |  |
| Exercise attendance | Yes | 5 |
| Term paper | Yes | - |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Petrović Milica | Stočarstvo | Poljoprivredni fakultet, Beograd | 2000. |
|  | Milošević, N.,Perić,L | Tehnologija živinarske proizvodnje | Poljoprivredni fakultet, Novi Sad | 2011 |
|  | Krajnović, M., Šahinović, R., Vegara, M. | Osnove opšteg stočarstva | Biotehnički fakultet u Bihaću | 2004 |
|  | Taylor, R. E. Field, T. G. | Scientific Farm Animal Production | Colorado State University | 2011 |

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| --- | --- |
| Course: | *Biodiversity* |
| Course id:3ОAG4О17 |
| Number of ECTS: 5 |
| Teacher: | Dragana Rajković, PhD., Dejana Džigurski, PhD., Branka Ljevnaić-Mašić, PhD., Aleksandra Petrović, MSc |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 4 | Practical classes: 1 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None/navesti ako ima |
| 1. Educational goal

Introducing students to the basic concepts of biological diversity of wildlife with emphasis on biodiversity in Serbia.Training students in endangered species identification, their systematics and risk groupsclassification, red list status of speciesand subspecies. Acquiring the necessary knowledge for active involvement in the protection of biodiversity of Serbia and different types of endangered habitats and ecosystems. |
| 1. Educational outcomes

The student is qualified for further education through master's and PhD studies.Theoretical and practical knowledge of global biodiversity and its preservation with emphasis on biodiversity of Serbia. Valuation of vulnerability and participation in the protection of rare and endangered plant and animal species. Knowledge of endangeredspecies classification and their conservation status, as well as implementation ofthe adequate measures to protect biodiversity. |
| 1. Course content

Lectures: Zoological part: Definition and levels of biodiversity. Global, scientific and economic importance of biodiversity. Anthropogenic factors that negatively affect and threaten biodiversity. International agreements, standards, criteria and programs for the preservation, conservation and sustainable use of biodiversity. The diversity of different animal groups in Serbia withreview of the species of international importance: Nematoda, Oligochaeta, Mollusca, Cladocera and Copepoda, Acarina, Insecta,Pisces, Amphibia, Reptilia, Aves and Mammalia. Protected natural systems, habitats and ecosystems. Botanical part: Scientific, economic and social aspects of biodiversity conservation.Biodiversity in fragile ecosystems and areas of Serbia of international importance.The main climatic, geological and pedological factors of biodiversity of terrestrial and aquatic ecosystems. The practical importance of preserving the diversity of plant life. The richness and taxonomic diversity of vascular flora of Serbia. Basic features of vegetation diversity of Serbia. Term papers from selected areas.Exercise:Zoological part: Classification and presrevation of important species such as: mites, ticks, selected groups of insects, fish, amphibians, reptiles, birds and mammals.Botanical part: Pterydophyta-Equisetopsida, Gymnospermae-Pinaceae, Cupressaceae, Taxaceae. Magnoliophyta - Magnoliopsida and Liliopsida in aquatic and terrestrial ecosystems. Adventive and invasive plant species. |
| 1. Teaching methods

Lectures – oral, textual and illustrative / demonstrative methods.Practical classes - management of students’ individual work and demonstrative / illustrative methods |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam (izabrati) | Mandatory | Points |
| Lecture attendance | Yes | 5 | *Written part of the exam-tasks and theory* | Yes | 30 |
| Test | Yes | 30 |  |
| Exercise attendance | Yes | 5 |
| *Term paper* | Yes | 30 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Grupa autora | Biodiverzitet Jugoslavije sa pregledom vrsta od međunarodnog značaja | Ekolibri i Biološkifakultet Beograd | 1995 |
|  | Spicer J.I. | Biodiversity: a beginner’s guide | Oneworld Publications, Oxford | 2006 |
|  | Grupa autora | Crvena knjiga flore Srbije 1-iščezli i krajnje ugroženi taksoni | Biološki fakultet, Univreziteta u Beogradu, Zavod za zaštitu prirode Republike Srbije | 1999 |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

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| --- | --- |
| Course: | *Urban Entomology* |
| Course id:3ОAG5О19 |
| Number of ECTS: 6 |
| Teachers: | Dušan Petrić, PhD, Professor, Tatjana Kereši, PhD, professor, Aleksandra Ignjatović Ćupina, PhD, Assistant Professor |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 4 | Practical classes: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

Acquiring knowledge of insects which breed or spend a part of their life in urban environment; role of insects in rural and urban habitats. |
| 1. Educational outcomes

Acquired knowledge represent the basis for independent insect identification, determination of consequences of insect activity and application of integrated measures of plant protection, food protection, human and animal health protection and environment protection. |
| 1. Course content

*Theoretical lessons:*Importance and specificities of pest insects in urban environment. Estimation of losses. The most important pests from the superclass Hexapoda (taxonomy, systematic, morphology, biology, ecology and behavior, economic importance). Beneficial insects and species which adorn the environment. Insects which affect the ambient hygiene, vectors of transmissive diseases, molestants, polyphagous and specific pest species of trees, shrubs, flowers and vegetables grown in open field conditions and greenhouses. Preventive, physical and biological measures of pest control in urban environment. *Practical classes: laboratory exercises*Laboratory exercises are based on individual work of students on identification of immature and adult insect stages. Methods of insect collection and preservation, field exercises. Specific methods of insect pest detection in urban environment.  |
| 1. Teaching methods

The theoretical classes are conducted by lessons,presentations and other didactic tools. Practical classes concern individual student work and demonstrative/illustrative methods. Check of theoretical knowledge includes 9 tests related to study units, 3 tests which require the combining of acquired knowledge and 1 final test. Individual work is performed by the use of binocular/microscope and identification keys. Check of practical knowledge. Consultations related to theoretical/ practical lessons and preparation of seminars. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam  | Mandatory | Points |
| Lecture attendance (9 tests) | Yes | 9 | Written part of the exam Oral part of the exam | Yes | 2030 |
| Test (3 combined tests) | Yes | 6 |  |
| Exercise attendance | Yes | 15 |
| Colloquium  | Yes | 20 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Petrić D, i sar. | General entomology, book, CD | University of Novi Sad, Faculty of Agriculture | 2007 |
|  | Petrić D, i sar. | General entomology, *practicum*, CD | University of Novi Sad, Faculty of Agriculture | 2007 |
|  | Ignjatović-Ćupina A. & Petrić D. | Keys for families of the superclass Hexapoda, CD  | University of Novi Sad, Faculty of Agriculture | 2012 |
|  | Sekulić R., Spasić R., Kereši T. | Štetočine povrća i njihovo suzbijanje | Poljoprivredni fakultet Novi Sad, Poljoprivredni fakultet Beograd, Institut za ratarstvo i povrtarstvo Novi Sad | 2008 |
|  | Mihajlović Lj. | Šumarska entomologija  | Šumarski fakultet, Beograd | 2008 |
|  | Kereši T. | Entomofauna of field and vegetable crops - practical book | Faculty of Agriculture, Novi Sad | 2010 |
|  | Alford, V.D. | A Color Atlas of Pests of Ornamental Trees, Shrubs and Flowers. | Timber Press, Portland, Oregon, USA | 2003 |

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| --- | --- |
| Course: | *Field and Vegetable Crops Production* |
| Course id: 3ОAG5О20 |
| Number of ECTS: 6 |
| Teacher: | Ph.D. Jovan Crnobarac, Ph.D. Žarko Ilin; contributors: Ph.D. Dragana Latkovic, M.Sc. Boris Adamović |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 3 | Practical classes: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None/navesti ako ima |
| 1. Educational goal

The aim of the course is that students learn how to in conditions of Serbia can achieve higher and stable yields of good quality with satisfactory profitability and conservation of agro ecosystems. |
| 1. Educational outcomes

After completion of lectures and exercises student will be qualified and informed with the basic elements of growing technology of field and vegetable crops. After passing the exam, the candidate will be qualified to lead the production of cultivated plants and to be successful in this production; and will be trained to combine the knowledge, ability and skills with the given environmental and edaphic conditions. |
| 1. Course content

***Theoretical teaching***: In the part of field crops will be studied the next plant species: wheat, barley, corn, beans, soybeans, peas, sunflower, canola, hemp, sugar beets, potatoes, tobacco and alfalfa. From vegetable crops will be studied: carrots, parsley, celery, parsnip, beetroot, radish, onion, garlic, leek, shallot, welsh onion, cabbage, kale, cauliflower, broccoli, brussels sprouts, collards, cabbage, Chinese and Peking cabbage, lettuce, spinach, endive, tomatoes, peppers, eggplant, cucumber, melon, watermelon, pumpkin, green peas, green beans, asparagus, artichokes, rhubarb, horseradish. At each crop will be studied the following: 1. General characteristics: economic importance, area and yields in the world and in our country, geographic distribution and origin of the species. 2. Biological characteristics and requirements for growing conditions in the vegetation period and phonological stages. 3. Production Technology: crop rotation, selection of preceding crops and suitability of each crops for the next crop, tillage and seedbed preparation; fertilization (manner, time, relation of N:P:K, quantity of this nutrients and some specificity of crops); sowing (varieties and hybrids, seed quality and seed preparation, sowing time and method of planting, ie, sowing rate and density of crops with emphasis on varietal specificity) and depth of sowing; crop care (fight against weeds, pests and diseases, fertilization with nitrogen – topdressing and specific measures of care); harvest (physiological and technological maturity, moment and way of harvesting, machines for harvest and storage). Through teaching of the production technology will be constantly emphasizes the role and importance of timely and quality of performance of all agro-technical measures and the possibility of rationalization of production processes by using the latest achievements of science and practice.***Practical exercises***: Introduce students to the botanical division, morphological characteristics and developmental stages of the plants specified, using slides, and fresh and dry material from the laboratory. |
| 1. Teaching methods

Lectures, Practice/ Practical classes, Consultations |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Activity during lectures | Yes | 6 (field crops) + 4 (vegetable crops) | *Oral part of the exam* | Yes | 42 (field crops) + 28 (vegetable crops) |
| Colloquium | Yes | 12 (field crops) + 8 (vegetable crops) |  |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Bharat P. Singh | Industrial Crops and Uses | Fort Valley State University, Fort Valley, Georgia, USA, CAB International  | 2010 |
|  | John H. Martin, Richard P. Waldren, David L. Stamp | Principles of Field Crop Production | Pearson Education Inc., Upper Saddle River, New Jersey, Columbus, Ohio, USA | 2006 |
|  | Robert G. Hoeft, Emerson D. Nafziger, Richard R. Johnson and Samuel R. Aldrich | Modern corn and soybean production | MCSP Publications; 1st edition | 2000 |
|  | Internet sources; Thematic domestic and international journals |
|  | Lecture notes of professors and assistants |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE 21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES AGRICULTURAL ECOLOGY AND ENVIRONMENTAL PROTECTION |
| Table 5.2 Course specification |

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| --- | --- |
| Course: | *Ecology of plant pathogenic microorganisms* |
| Course id: 3OAG5021 |
| Number of ECTS: 6 |
| Teacher:  | Dr Vera B. Stojšin, Dr Dragana B. Budakov |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 4 | Practical classes: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | Microbiology |
| 1. Educational goal

Introduction to the environmental and agro-ecological factors that influence the development of plant pathogenic microorganisms and disease occurrence in plants. |
| 1. Educational outcomes

Knowledge of environmental factors that influence the development of plant pathogenic microorganisms, which contributes to more efficient plant protection, preservation of the environment and production of healthy and safe food. |
| 1. Course content

*Theory lessons -* Concept and definition of plant diseases, the subject of general phytopathology, historical development of plant pathology. Damages caused by plant diseases, division of plant diseases depending on the type of causal agent. Parasitic diseases: basic concepts of parasites, types of parasites and parasitic diseases, pathogenicity, virulence, pathogenesis, pathogenicity testing. The basic characteristics of the causal agents of plant diseases, parasites: fungi-like organisms, fungi, bacteria and viruses, phytoplasmas and vascular bacteria, semi-parasitic and parasitic plants. Pathogenesis, ecology, epidemiology of plant diseases. Introduction to plant diseases cause by factors of biotic and abiotic factors. Influence of environmental and soil factors on appearance, spreading and development of plant pathogens and diseases. Mycotoxicogenic fungus. Influence of cultural and other measures on microclimatic conditions in crops with the aim to stop disease development. Fundamentals of general prophylaxis and treatment.*Practical teaching: Exercises, Other modes of teaching, Study research work*General techniques of laboratory work with plant pathogenic microorganisms. Identification of pathogens, the detection of pathogens. Types of symptoms of plant diseases caused by: fungi-like organisms, fungi, bacteria and viruses, phytoplasmas and vascular bacteria, semi-parasitic and parasitic plants, abiotic factors. Fundamentals of morphology and systematics of the causal agents of plant diseases. |
| 1. Teaching methods

Lectures, Practical classes, Consultations, Seminars given by students. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 5 | *Written or oral part of the exam-tasks and theory* | Yes | 50 |
| Test regarding material from practical classes (colloquium) | Yes | 30 |  |
| Exercise activity | Yes | 5 |
| *Term paper* | No | 10 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Stojšin, V., Bagi, F., Balaž, F. | Plant pathology textbook- mycosis and pseudomycoses of field and vegetable crops (in Serbian) | Faculty of Agriculture Novi Sad | 2008 |
|  | Balaž, F., Balaž, J., Tošić, M., Stojšin, V., Bagi, F.  | Phytopathology. Diseases of crops and vegetables (in Serbian) | Faculty of Agriculture Novi Sad | 2010 |
|  | Babović, M. | Basics of plant pathology (in Serbian) | University of Belgrade, Faculty of Agriculture | 2003 |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

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| --- | --- |
| Course: | *Invasive organisms* |
| Course id:3OAG5O22 |
| Number of ECTS: 5 |
| Teacher: | Konstantinović I. Branko, Kereši B. Tatjana, Konstantinović B. Bojan, Popović M. Aleksandra |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures:4 | Practical classes:2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | Passed colloquium; certified practical classes attendance  |
| 1. Educational goal

Acquiring knowledge on biology and ecology of invasive and quarantine weeds and insects in agriculture and urban environment and their chemical control. |
| 1. Educational outcomes

Basic knowledgeof invasive and quarantine weed species in agriculture and the urban environment and their negativeeffects on humans and the environment. Ability of identificationand knowledge of biology and ecology of invasive insects, in orderto prevent their breaking or spreadingin our country. |
| 1. Course content

*Lectures:*The impact of invasive weeds and insects on agricultural production. Spreading and importance of invasive weeds and insects. Invasive species of weeds and insects in our country. Harmful effects of invasive weeds and insects on the environment andhuman health. Chemical control of invasive weed species using herbicides.Biological control of invasive weed species using insects. Integral measures to combat invasive insects. Quarantine species of weeds and insects, their distribution and suppression.*Practical classes:*Practical lectures include taxonomy of invasive and quarantine weeds and insects using handbook for their identification.Determination of pollen of some allergens invasive weed species. |
| 1. Teaching methods

Lectures, Practical classes, Consultations, Research work |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam (izabrati) | Mandatory | Points |
| Activity during lectures | Yes | Up to 10 | *Oral exam* | Yes | 30 |
| Practical classes attendance |  |  |  |
| Colloquium | Yes | Up to 20 |
| Tests |  | Up to 40 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Mihajlović, Lj. | Šumarska entomologija | Šumarski fakultet, Beograd | 2008 |
|  | Sekulić, R., Spasić, R, Kereši, T. | Štetočine povrća i njihovo suzbijanje. | Poljoprivredni fakulteti, Novi Sad iBeograd, Institut za ratarstvo i povrtarstvo, Novi Sad | 2008 |
|  | Kereši, t., Ivanović, M., Tolić, D.  | Moljac paradajza (Tuta absoluta Povolny) - nova potencijalna opasnost za paradajzu Srbiji. | Biljni lekar, Poljoprivredni fakultet, Novi Sad | 2010 |
|  | Kereši, T., Sekulić, R., Protić, LJ., Milovac, Ž. | Pojava stenice Nezara viridula L. (Heteroptera: Pentatomidae) uSrbiji.  | Biljni lekar, Poljoprivredni fakultet, Novi Sad | 2012 |
|  | Konstantinović, B. | Poznavanje i suzbijanje korova | Univerzitet u Novom Sadu, Poljoprivredni fakultet | 1999 |
|  | Konstantinović, B. | Biologija, ekologija i suzbijanje korova | Univerzitet u Novom Sadu, Poljoprivredni fakultet | 2005 |
|  | Konstantinović B., Bošković J. | Biotehnologija u zaštiti bilja | Univerzitet u Novom Sadu, Poljoprivredni fakultet | 2001 |
|  | Konstantinović, B. | Korovi i njihovo suzbijanje | Univerzitet u Novom Sadu, Poljoprivredni fakultet | 2008 |
|  | Konstantinović, B. | Osnovi herbologije i herbicidi | Univerzitet u Novom Sadu, Poljoprivredni fakultet | 2011 |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

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| --- | --- |
| Course: | *Urban zoology* |
| Course id: 3OAG6О23 |
| Number of ECTS: 6 |
| Teacher: | **Dragana Rajković, PhD., Aleksandar Jurišić, PhD., Aleksandra Petrović, MSc** |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 4 | Practical classes: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None/navesti ako ima |
| 1. Educational goal

Introducing students to the basics of zoology in urban areas. Education and training students in assessment of the state of animal species diversity in the urban environment and their impact on humans, other animals and their habitat, as well asanthropogenic impact on urban populations of different species. |
| 1. Educational outcomes

The student is qualified for further education through master's and PhD studies.Theoretical and practical knowledge of zoology in urban areas. Interactive assessment and use of anthropogenic factors impact on urban populations of different animal species. Knowing the characteristics of animalpopulations and their useand control measures in environmental protection fromsanitary, medical and veterinary aspects. |
| 1. Course content

Lectures: Introduction to urban zoology. The concept and characteristics of urban habitats. Characteristics of animal populations in the urban habitats. The causes and consequences of the appearance and maintenance of different species population importantfor communal hygiene, medicine, veterinary medicine, and environmental protection. Animal groups of importance to urban habitats:Protozoa, Plathelminthes, Nematode, Annelida, Arthropoda, Mollusca, Pisces, Amphibia, Reptilia, Aves, Mammalia. Monitoring and control measuresfor potential pests and vectors. Monitoring and preservation of protected species. Characteristics of animal population in urban areas.Exercise: Systematics and identification of various animal species in urban habitats: Protozoa from infuzum, Trematodes, Cestodes, Nematodes, Annelida, Acarina, Mollusca, Pisces, Amphibia, Reptilia, Aves and Mammalia. |
| 1. Teaching methods

Lectures – oral, textual and illustrative / demonstrative methods.Practical classes - management of students’ individual work and demonstrative / illustrative methods |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam (izabrati) | Mandatory | Points |
| Lecture attendance | Yes | 5 | *Oral part of the exam* | Yes | 30 |
| Test | Yes | 30 |  |
| Exercise attendance | Yes | 5 |
| Colloquium | Yes | 30 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Robinson W.H. | Urban Insects and Arachnids: A Handbook of Urban Entomology | Cambridge University Press | 2005 |
|  | Bonnefoy X., Kampen H., Sweeney K. | Public Health Significance of Urban Pests. | World Health Organization | 2008 |
|  | Hickman, Jr. C.P., Roberts, L.S., Keen, S.L., Larson, A., I’Anson, H., Eisenhour, D.J. | Integrated Principles Of Zoology14th Ed. | McGraw-Hill, New York, USA | 2008 |
|  | Bowman D.D. | Georgis Parasitology for Veterinarians7th edition. | W.B. Saunders Company | 1999 |
|  | Rajković, D., Kostić, D. | Praktikum iz poljoprivredne zoologije | Univerzitet u Novom Sadu,Prirodno-matematički fakultet, Institut za biologiju, Novi Sad | 1995 |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

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| **Agroecologyandenvironmental protection**Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

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| --- | --- |
| Course: | *Plant Pathogens in Urban Areas*  |
| Course id: 3OAG6O24 |
| Number of ECTS: 6 |
| Teacher:  | Jelica S. Balaž, Stevan N. Maširević, Mila S. Grahovac |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 4 | Practical classes: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses:  | Microbiology |
| 1. Educational goal

The aim of the course is to acquire basic knowledge about diseases of cultivated and ornamental plants and the use of appropriate protection measures in terms of the urban environment. |
| 1. Educational outcomes

Knowledge gained in this course is the basis for the diagnosis of plant diseases urban environment, implementing and managing various measures of protection in the production of cultivated and ornamental plants. The outcome of this course is to master effective protection of plants in urban environments while reducing losses, material consumption and preserving the environment. |
| 1. Course content

*Lectures*Acquiring knowledge about the biology, epidemiology and ecology of plant pathogens, with ecological niche in urban areas (parks, alleys, green areas and gardens). Units of study are pathogenic fungi, bacteria, viruses and phytoplasmas. Students will become familiar with the symptoms, prevalence, economic damages and the basic characteristics of plant pathogens important for identification. These findings provide the basis for the implementation of appropriate and expedient protection measures. To master protection of plants in urban areas, in lectures preference will be given agro-technical and alternative protective measures, which will be combined with the mechanical, physical, and chemical measures.*Practical classes*General techniques of laboratory work with phytopathogenic microorganisms. Identification of pathogens: morphology, some of the cultural, biochemical-physiological and serological characteristics of the pathogen; proving pathogenicity (Koch's postulates); types of symptoms. |
| 1. Teaching methods

Lectures, Practical classes, Consultations, Research work |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam (izabrati) | Mandatory | Points |
| Activity during lectures | Yes | 10 | *Oral part of the exam* | Yes | 20 |
| *Written part of the exam* | Yes | 50 |
| Test regarding material from practical classes (colloquium) | Yes | 20 |  |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Balaž, F., Balaž, J., Tošić, M., Stojšin, V., Bagi, F. | Fitopatologija – bolesti ratarskih i povrtarskih biljaka | University of Novi Sad, Faculty of Agriculture | 2010 |
|  | Delibašić G., Babović M. | Opšta fitopatologija - praktikum | University of Belgrade, Faculty of Agriculture | 2006 |
|  | Janse, J.D. | Phytobacteriology, Principles and Practice | CABI | 2006 |
|  | Ivanović, M., Ivanović, D. | Mikoze i pseudomikoze biljaka | University of Belgrade, Faculty of Agriculture | 2001 |

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| Course: | INTEGRATED AND ORGANIC FRUIT AND GRAPE PRODUCTION  |
| Course id: |
| Number of ECTS: 6 |
| Teacher: | Nenad P. Magazin, Nada S. Korać  |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures:3 | Practical classes:2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

To provide students with knowledge about integral and organic production and to be trained to work in the plantations raised and guided by the principles of this production. Proper selection of fruit species, cultivars and rootstocks of fruit trees and vines is one of the main factors for successful practicing integrated and organic production. A correct choice of locations and positions is very important for establishing an orchard within the system of integratedand or organic production as well as knowledge of modern scientific findings and permitted phytotechnical and sanitary measures. |
| 1. Educational outcomes

The acquired level of knowledge will enable graduates to independently make appropriate decisions about the choice of site, location, fruit species, varieties and rootstocks of fruit trees and vines, while raising crops by the methods of organic production. The gained level of knowledge allows the student to correctly choose the necessary agrotechnical, pomotechnical and amphelotechnical measures in accordance with principles of organic production and to apply them in the plantation. Mistakes that occur during orchard establishment can not be subsequently corrected therefore the knowledge on the above case is of great importance.  |
| 1. Course content

Theory lessonsConcept, importance and principles of organic production of fruit and grapes. Legislation on organic fruit and grapes production in the world and in Serbia. The choice of location and position of the plantation. The choice of species and varieties of fruit trees and vines. The choice of rootstocks and planting material. Cultivation and maintenance of the soil. Nutrition of fruit trees and vines. Pests, diseases and weeds.Irrigation. Harvesting and storage of fruits and grapes. Fruit and grapes from organic production. Organic wine. Practical classesIntroduction to the domestic and international regulations on organic production of fruit and grapes. Choice of fruit species and varieties suitable for organic producers. Orchards and vineyards established on the principles of organic production (soil preparation, planting materijal, planting, production technology, cover cropping, nutrition, irrigation, pest and disease control). Methods for determining the the moment of harvest and storage conditions of fruit and grapes from organic production. Creating a project to establish organic orchards and vineyards. Production of organic wines. |
| 1. Teaching methods

Lectures, practical work in classroom, laboratory and in the experimental fields. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam (izabrati) | Mandatory | Points |
| Lecture attendance | Yes | 5 | *Oral part of the exam* | Yes | 30 |
| Test | Yes | 5 |  |
| Exercise attendance | Yes | 20 |
| Seminar | Yes | 40 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Injac, M., Dorić, M., Petrović, J., Tamaš, V., Gošić, J.: Zaštita jabuke u integralnoj i organskoj proizvodnji, Poljoprivredni fakultet Novi Sad, 2013.  |
|  | Keserović, Z, Korać, N., Magazin, N., Grgurević, V., Gvozdenović, D., Bijelić, S., Vračević, B: Proizvodnja voća i grožđa na malim površinama, Poljoprivredni fakultet Novi Sad, 2008. |
|  | Keserović, Z., Vračević, B., Magazin, N., Bijelić, S.: Organska proizvodnja voća. Poglavlje u monografiji autora: Lazić, B., Babović, J: Organska poljoprivreda, tom 2, str. 357-413. Institut za ratarstvo i povrtarstvo, Novi Sad, 2008. |
|  | Korać Nada: Organsko vinogradarstvo. Zadužbina Andrejević, Beograd, 2011. |
|  | Korać Nada: Organska proizvodnja grožđa, poglavlje u monografiji autora: Lazić, B., Babović, J: Organska poljoprivreda, tom 2, str. 415-461. Institut za ratarstvo i povrtarstvo, Novi Sad, 2008. |
|  | Lind, K., Lafer, G., Schloffer, K., Innerhofer, G., Meister, H: Organic Fruit Growing, CAB International, 2003. |
|  | Magazin, N., Keserović, Z., Milić, B., Dorić, M., Gošić, J.: Berba i čuvanje plodova jabuke iz integralne proizvodnje, Poljoprivredni fakultet Novi Sad, 2013. |
|  | Regner, F: Integralna proizvodnja u vinogradarstvu (poglavlje u knjizi: Priručnik za proizvođače grožđa i vina). Poljoprivredni fakultet, Novi Sad, 2011 |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE 21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental Protection** |
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| --- | --- |
| Course: | *Biological contamination of agricultural products* |
| Course id:3OAG6O26 |
| Number of ECTS: 5 |
| Teacher:  | Dr Radmila S. Almaši, Dr Ferenc F. Bagi, Dr Aleksandra M. Popović, Dr Dragana B. Budakov |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 3 | Practical classes: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | Microbiology |
| 1. Educational goal

Introduction to the harmfulness of contamination of agricultural products by biological contaminants, sources of biological contamination of food. Introducing the biological contaminants of food, conditions for their development and preventive measures in order to prevent the formation of harmful metabolites (mycotoxins) in agricultural products, as well as measures to eliminate pests. Possibilities to decontaminate agricultural products. |
| 1. Educational outcomes

The production of safe food and feed, without the presence of pests and mycotoxins.  |
| 1. Course content

*Theory lessons Entomology:* Causes of damage of agricultural products. The economica importance and specificity of pests, assessment of loss. The most important pests of cereals, flour, grain legumes, herbs, dried fruit, nuts, meat and other dried products in stores. The most important pests of fruits and root and tuber vegetables. Lectures will include the name of the speices, systematic position, economic importance, symptoms of damage, morfology and biology of insects.Plant pathology: Introduction to plant pathogenic organisms, contaminants and potential producers of mycotoxins in food, conditions for synthesis of harmful metabolites and possibilities of prevention and detoxifying agricultural products.*Practical teaching: Exercises, Other modes of teaching, Study research work* Entomology-Methods for detection of pests in stores, visible and hidden pest attack. Determination of hurmful insects, morfology, symptoms of damage , short biology and damages - individual examination of stuffed and preserved specimens and damage. Plant pathology: Practical knowledge (microscopy) and determination of toxigenic microorganisms. Morphological, cultural, molecular, toxigenic properties. |
| 1. Teaching methods

Lectures, Practical classes, Consultations, Seminars given by students. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Term paper Entomology | Yes | 5 | *Written or oral part of the exam-tasks and theory Entomology* | Yes | 30 |
| Term paper Phytopathology | Yes | 5 | *Written or oral part of the exam-tasks and theory Phytopathology* | Yes | 30 |
| Colloquium Entomology | Yes | 15 |
| Colloquium Phytopathology | Yes | 15 |  |  |  |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Stojšin, V., Bagi, F., Balaž, F. | Plant pathology textbook- mycosis and pseudomycoses of field and vegetable crops (in Serbian) | Faculty of Agriculture Novi Sad | 2008 |
|  | Balaž, F., Balaž, J., Tošić, M., Stojšin, V., Bagi, F.  | Phytopathology. Diseases of crops and vegetables (in Serbian) | Faculty of Agriculture Novi Sad | 2010 |
|  | Štrbac, P. | Štetočine uskladištenih proizvoda | Faculty of Agriculture Novi Sad | 2002 |
|  | Tanasijević, N., Simova-Tošić, D. | Posebna entomologija | Naučna knjiga, Beograd | 1987 |
|  | Almaši, R., Injac, M.,Almaši, Š. | Štetni i korisni organizmi jabučastog voća | Poljoprivredni fakultet, Novi Sad | 2004 |
|  | Sinovec,Z.J., Resanović, R.M., Sinovec, S.M. | Mikotoksini, pojava, efekti i prevencija | Univerzitet u Beogradu, Fakultet veterinarske medicine | 2006 |
|  | Škrinjar, M. i Tešanović, D. | Hrana u ugostiteljstvu i njeno čuvanje | Univerzitet u Novom Sadu, Prirodno-matematički fakultet | 2007 |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

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| --- | --- |
| Course: | *Renewable Energy Sources* |
| Course id:3ОAG7О28 |
| Number of ECTS:3 |
| Teacher: | Dr.Mirko Babić, assistant: Milivoj Radojčin, MSc |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 2 | Practical classes: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None/navesti ako ima |
| 1. Educational goal

To introduce students with the types and specifics of renewable energy sources. Students acquire basic knowledge about the possibilities and principles of the conversion of these types of energy. |
| 1. Educational outcomes

The training students for evaluating the possibility of using renewable energy sources in different cases. The student is trained to perform an adequate selection and conversion of energy. |
| 1. Course content

*Theory lessons*Basic concepts of energy. Energy and the environment. Energy sustainability. Global trends in the use of renewable energy sources (RES). Politics of RES in the European Union. Specifics of certain renewable sources. Biomass. Solar energy. Wind energy. Hydropower. Energy conversion. The combustion of biomass. Pyrolysis and gasification of biomass. Production of liquid fuels from biomass - biodiesel and bioethanol. Fuel cells. Heating systems. Solar energy receivers. The conversion of solar energy into thermal, electrical and mechanical energy. Conversion wind energy into mechanical and electrical energy. Hydro. Geothermal energy. The heat pump.*Practical teaching: Exercise, Other modes of teaching, Study research work*The arithmetic exercises in the field of conversion and energy balance. Essay. The theme of the essay is energy sustainability for the selected biotechnical system. Demonstration laboratory exercise of the conversion of biomass energy and solar energy. Visits to existing systems for the conversion of renewable energy sources. |
| 1. Teaching methods

The teaching is an oral with the help of Power Point presentations and practical training consists of the computation, working of seminar papers and visits to facility. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 5 | *Oral part of the exam* | Yes | 15 |
| Test | Yes | 55 |  |
| Exercise attendance | Yes | 5 |
|  *Test, Term paper,* | Yes | 20 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Mirko Babić | Renewable energy sources, authorized lectures | Faculty of Agriculture Novi Sad | 2011 |
|  | Osamu Kitani | CIGR: Handbook of agricultural engineering – Energy and biomass engineering | Americansociety of agricultural engineers | 1999 |
|  |  | Directives and regulations of the European Union in the domain of renewable energy. |  |  |
|  |  | The regulations of the Republic of Serbia in the domain of renewable energy sources |  |  |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

|  |  |
| --- | --- |
| Course: | *Environmental and Natural Resources Management* |
| Course id: 3ОАG7О29 |
| Number of ECTS: 4 |
| Teacher: | Vesna O. Rodić, Jelena J. Karapandžin |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 4 | Tutorials: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. **Educational goal**

The goal of the course is to enable students (as future decision-makers) to perceive the relationships between agriculture and environment, to recognise the unsustainability of making exclusively economic valuation and understand the need to include the environmental criteria in the process of decision-making. |
| 1. **Educational outcomes**

Through this course, students develop the capability of critical thinking, adopt new attitudes and values related to natural resources and environment, gain better understanding of the importance of sustainable development, become capable of perceiving the interdependence between agriculture and environment, and of organising production which is both economically acceptable and environmentally friendly. |
| 1. **Course content**

*Theoretical Instruction:* Introduction; The main environmental problems; The main causes of contemporary ecological crisis; Natural resources – the concept and classification; Sustainable use of natural resources; Problems in natural resources management in developing countries; The concept of the sustainable development; The strategy of the sustainable development in Serbia; Agriculture and environment; The problems in management of water and land resources; Environmentally friendly systems of agricultural production; Organic production; Environmental monitoring; Measures and actions of environmental protection; Market failure; The concept of externalities; Internalisation of external costs; Optimisation of socially-acceptable level of pollution (Coase theorem and Pigouvian taxation); Environmental management tools; Importance of international cooperation; Legal framework in the field of environmental protection.*Practical Instruction:* Tutorials include seminar papers and active participation of students in discussions on selected topics. The topics may include: the Millennium Development Goals, climate changes, demographic pressure on the environment, negative impact of urbanisation of the environment, environmental awareness, the importance of developing alternative energy sources, problems in waste management, recycling as a means of environmental protection, the possibility of rational use of land using vertical farms, the importance of green spaces for the quality of environment, GMO–opportunity or threat, agriculture as a pollutant, agriculture as a producer of energy, the importance of good agricultural practice, the importance of using GPS for environmental protection, international sources of assistance for good environmental protection, ecological footprint, the importance of environmental management standardisation (ISO 14000), Local Environmental Action Plan (LEAP), public participation in environmental decision-making ( the Aarhus Convention). Other topics are also possible if there is interest.  |
| 1. **Teaching methods**

Traditional lectures (based on Power Point presentations), seminar papers, discussion groups, individual tutorial work with students, field work (visiting institutions or companies and discussion about the main environmental issues and their possible solutions). |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam  | Mandatory | Points |
| Lecture attendance | Yes/No | 9 | *Oral part exam* | Yes | 40 |
| Practical work | Yes/No | 6 |  |
| Test 1 and test 2 (15+20) | Yes/No | 35 |
| Seminar paper | Yes/No | 10 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Rodić, V. | Environmental and Natural Resources Management | Faculty of Agriculture, Novi Sad | 2012 |
|  | Jonathan, H. | Environmental and Natural Resource Economics: A Contemporary Approach | DATA status Belgrade | 2009 |
|  | Milanović, i sar. | Natural Resources - Economy, Ecology, Management | Institute for Agricultural Economics Belgrade | 2008 |
|  | Golušin, M. | Ekomenadžment (Ecomanagement) | Faculty for Entrepreneurial Management Novi Sad | 2006 |
|  | Bošković, J., Ivanc, A., Simić, J. | Održivi razvoj poljoprivrede i zaštita životne sredine  | Megartend univerzitet, Beograd | 2003 |
|  | Pešić, R. | Ekonomija prirodnih resursa i životne sredine | Poljoprivredni fakultet, Zemun-Beograd | 2002 |

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| Course:  | *Pesticides 1* |
| Course id: 3OAG7O30 |
| Number of ECTS: 5 |
| Teacher: | Sanja D. Lazić, Dušanka V. Inđić, Vojislava P. Bursić, Slavica M. Vuković |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 2 | Practical classes: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

Introduction to plant protection products, modes of production, physical and chemical characteristics, toxicity, behavior in the environment, working with pesticides. To gain basic knowledge about the biological characteristics of pesticides and their purpose and effects, as well as the assessment of risks to the environment. |
| 1. Educational outcomes

Acquired - applicable knowledge about pesticide formulations, precautions when working with these products and the modes of application that leave minimal residues in agriculture products. The acquired knowledge will contribute to a better knowledge of pesticides as active substances, their effects and possible consequences for the environment. |
| 1. Course content

*Theoretical classes*: History of pesticide application, classification, production methods, non-pesticide matters in compounds, physico-chemical properties. Pesticide behaviour in plants, water and soil, PHI, tolerance, working PHI. Pesticide toxicology: Organochlorine insecticides, organophosphorus insecticides, carbamates, pyrethroids,obtaining, effect, decomposition and toxicity Impurities by product of manifacture and industrial impurities.The application of pesticides (fungicides and zoocides) in agriculture (significance, clasiffication, conditions for the application, assessment of the effects, potential consequences), for the control of harmful populations and their maintenance at tolerant level using chemical and / or biological pesticides.*Other forms of teaching - laboratory exercises*: Wet sieve test, detrminaton of tap density, compact volume. Determination of specific gravity, density and weight per millitre. Determination of absorptive capacity. Determination of water content, looseness and hygroscopicity. Determination of acidity and alkalinity. Determination of viscosity and surface tension. Determination of HLB, suspension stability and emulsion stability. Production of pesticide compounds. Testing of physico-chemical properties of produced preparations. Determination of the active ingredient content in produced preparations by thin-layer chromatography. Determination of active matter content by UV spectrophotometry. Determination of sulphur contentDetermination of toxicity and efficacy of zoocides and fungicides, phytotoxicity tests, mixing of pesticides, strategy for pesticides application. |
| 1. Teaching methods

Lectures, Practical classes, Research work |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam (choose) | Mandatory | Points |
| Activity during lectures | Yes | 5 | *Oral part of the exam* | Yes | 50 |
| *Written part of the exam* | Yes | 35 |
| Test (colloquium) | No | - |  |
| Exercise attendance | No | - |
| Term paper | Yes | 10 |
| Literature  |
| Ord | Author | Title | Publisher | Year |
|  | Šovljanski R, Lazić S. | Osnovi fitofarmacije | University of Novi Sad, Faculty of Agriculture | 2007 |
|  | Šovljanski, R., Klokočar Šmit, Z., Lazić, S. | Praktikum iz opšte fitofarmacije | University of Novi Sad, Faculty of Agriculture | 2002 |
|  | Inđić, D., Vuković, S. | Praktikum iz Fitofarmacije (fungicidi, zoocidi) | University of Novi Sad, Faculty of Agriculture | 2012 |
|  | Vitorović, S., Milošević, M. | Osnovi toksikologije sa elementima ekotoksikologije, | University of Belgrade, Faculty of Agriculture | 2002 |
|  | Janjić, V., Elezović, I | Pesticidi u poljoprivredi i šumarstvu u Srbiji 2010 | Plant Protection Society of Serbia, Belgrade | 2010 |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

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| Course: | **Pesticides 2**  |
| Course id: 3OAG7O30 |
| Number of ECTS: 5 |
| Teacher: | Prof. Marija Zgomba, Prof. Maja Meseldzija, Prof Bojan Konstantinovic, Msc Dusan Marinkovic |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures:2 | Practical classes:2 | Other teaching types:- | Study research work:- | Other classes:- |
| Precondition courses | Pesticides |
| 1. Educational goal: The aim of the course is to provide students with basic knowledge of biocides: biological efficacy, phytotoxicity risk assessment and the implementation of the sound strategy.
 |
| 1. Educational outcomes

The acquired knowledge will contribute to a better knowledge of biocides as a part of the solution to the sound urban and rural environment. The students will recognize differences in toxicity level and the consequences of biocide treatments vs. alternative methods that could be used complementary or as substitutes to conventional products. Students should gain capability to work with biocides in a view of environmental protection, its preservation and recognition of safe, sustainable and environmentally friendly products. |
| 1. Course content

Pesticide application history, classification, forms of biocide production, active ingredients in biocidal products, physical and chemical properties. The use of pesticides in agriculture and biocides in area that correspond to the rural and urban environment. Biocides as a tool in providing ambient hygiene (prerequisites for the implementation and consequences of the implementation), in order to suppress abundance of pests to acceptable/tolerable levels. The mechanism of biocide action. Synergistic measures to control populations of harmful agents in agriculture and ambient hygiene. Diversity of products formulations for the operation of biocides Insect growth regulators. Biological products. *Bacillus thuringiensis* in the environment, ecology and risk assessment. ITU in biological and the potency of the products. Strategy in Integral approach to control synatropic insects. Legislative for Biocide Products within EU and Serbian harmonization of the current laws.Features and properties of pesticides and biocides in relation to the mechanism of action. Biocides application techniques, the degree of contamination of the environment with respect to toxicity, formulation, dose and choice of treatment/application . Evaluation of biocide biological efficacy rate. |
| 1. Teaching methods

 Lectures, Practical classes |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam (izabrati) | Mandatory | Points |
| Lecture attendance | Yes | 10 | *Oral part of the exam* | Yes | 60 |
| Exercise attendance | Yes | 10 |  |
| Test | Yes | 20 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Cooper J. And Dobson H.  | The benefits of pesticides to mankind and the environment | www.Sciencedirect.com | 2007 |
|  | Šovljanski R.,Lazić S., | Osnovi Fitofarmacije | Poljoprivredni fakultet Novi Sad | 2004 |
|  | Resh V. and Rosenberg D. | The Ecology of Aquatic Insects | Praeger, New York | 1994 |

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| Description: Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE 21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Description: Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and Environmental Protection** |
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| --- | --- |
| Course: | *Statistics* |
| Course id:3ОAG7О32 |
| Number of ECTS: |
| Teacher: | Dr Beba Mutavdžić |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 2 | Practical classes: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None/navesti ako ima |
| 1. Educational goal

The programof this courseallowsstudents to become familiarwiththe use of modernstatistical methods in solvingproblemsinthe fieldof agriculturalandbiological sciences.Students shouldfamiliarize themselves withdescriptivemethods andmethods of analysisof experimental results. |
| 1. Educational outcomes

Through theteaching process, students shouldacquire the abilitytousestatistical methodsandtheir application inagricultural, biologicaland related fields.Acquiredabilities andappropriate use ofstatistics andits methodsallowstudents to successfullysolve problems in thefuture workand in obtaining an education. |
| 1. Course content

Theoretical lessonsBasic Statistics. The concept andimportance of statistics. Statistical population. Statistical unitsandobservation characteristics. Statistical series.Typesof statistical series. Presenting statisticaldata. Making a frequency distribution. Measures of central tendency. Measures of variability. Measures of distributional shape. Theoreticaldistributions. Discrete and continuous probability distributions. Sampling methods. Population and sample*.*The selection of sample units. Basic sample plans. Characteristics of distribution of sample parameters. Principles of parameter estimation. Confidence interval. Determination of sample size.Hypothesis testing. Principles of hypothesis testing.Hypothesis testing for a population mean and a population proportion. Analysis of variance and assumptions for its implementation. The basic principles ofthe experimentin agriculture. Linear regression and correlation. Basic concepts. Ascatter plot.Choice of regression methods and methods of analysis.Practical classesAnalysisof numericalseries. Theoreticaldistributions. The sampling distribution. The point and the confidence interval estimation of the population mean and proportion. Statistical inference.Hypothesis testing. Regression and correlation. |
| 1. Teaching methods

Lectures, Practical classes |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam (izabrati) | Mandatory | Points |
| Lecture attendance | Yes | 10 | *Theoretical part of the exam/Oral part of the exam/* | Yes | 40 |
| Test | Yes | 40 |  |
| Exercise attendance | Yes | 10 |
| Other | No |  |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Hadživuković, S. | Statistical Methods | Faculty of Agricultural, Novi Sad | 1991. |
|  | Lozanov-Crvenković Z. | Statistics | Faculty of Sciences, Novi Sad | 2012. |
|  | Чобановић К | Examplesandexercisesin Statistics | Faculty of Agricultural , Novi Sad | 2003. |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

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| --- | --- |
| Course: | *Water Pollution Control* |
| Course id: 3OAG8O33 |
| Number of ECTS: 6 |
| Teacher: | Anđelka M. Belić, Milica D. Vranešević  |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 3 | Practical classes: 2 | Other teaching types: | Study research work: | Other classes: 30 |
| Precondition courses | None |
| 1. Educational goal

The aim of the course is that students learn the complexities of water within the environmental elements of aquatic ecosystems, research methods and procedures, quality changes and protection measures. |
| 1. Educational outcomes

Students will gain knowledge on water protection, the impact of pollutants on their quality, and therefore on the needs and possibilities of implementation of protection measures in the existing social and economic conditions - and with the application of the current legal regulations. |
| 1. Course content

Theory lessonsThe complexity of environmental protection and the importance of water in it. Contamination of aquatic ecosystems, important pollutants. Indicators of quality assessment and quality requirements according to the quality. Database for water protection. Methods for collecting data on water quality. Technical measures for the protection of water, the principles of regional planning and technical interventions. Principles of modeling of water quality. Procedures for waste water treatment. Constructed wetlands. The procedures for the processing, use and disposal of sludge.Practical classes :Calculation of the amount of polluted water users and the corresponding sizes for dimensioning. Calculation and dimensioning of the sewerage network. Calculation of hydraulic and biological load. Calculation of the degree of purification of polluted water. Calculation of self-cleaning power of watercourses. Preparation of a term paper. |
| 1. Teaching methods

Oral lectures, presentations using computers |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam  | Mandatory | Points |
| Lecture attendance | Yes | 5 | Oral part of the exam | Yes | 60 |
| Colloquium | Yes | 20 |  |
| Exercise attendance | Yes | 5 |
| Term paper | Yes | 10 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Richard Helmer and Ivanildo Hespanhol | Water Pollution Control | E & FN SPON | 1997 |
|  | Jamie Bartram and Richard Ballance | Water Quality Monitoring | E & FN SPON | 1996 |
|  | Deborah Chapman | Water Quality Assessments | CHAPMAN & HALL | 1992 |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

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| --- | --- |
| Course:  | *Chemical contamination of agricultural products* |
| Course id:3OAG8O34 |
| Number of ECTS: 5 |
| Teacher: | Vojislava P. Bursić, Slavica M. Vuković |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 4 x 15 = 60 | Practical classes: 3 x 15 = 45 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

Introduction to the risks of contamination of agricultural products by chemical pollutants. Sources of chemical contamination, penetration conditions and measures for preventing the formation of metabolites in agricultural products. Understanding the system of alerting and EU Directives. |
| 1. Educational outcomes

Acquired knowledge of the basic preconditions for the production of safe agricultural products, with the controlled application of agrochemicals. And the importance of detecting the presence of contaminants (residues of pesticides, dioxins, heavy metals and mycotoxins) in agricultural products. |
| 1. Course content

*Theoretical classes*: Contamination of land, water, agricultural crops and products from them, pesticides and other agrochemicals. Control of pesticide application depending on crop production (farming, pomology, vegetable growing) and the necessity of quality control of agricultural products. Pesticides, mycotoxins and plants – residues, degradation, PHI, MRLs. Introduction to the EU Regulations, as well as to the programmes for monitoring the trends concerning the chemical contamination of agricultural products. Alerting systems.*Other forms of teaching - laboratory exercises*: Detection of biological methods the presence of contaminants in water, sediments, soil and plant material. Efficacy evaluation and validation of the results of biological tests. Optimization and method validation of pesticides, mycotoxins content, POPs in different matrices (soil, water, agricultural products...). |
| 1. Teaching methods

Lectures, Practical classes, Research work |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam (izabrati) | Mandatory | Points |
| Activity during lectures | Yes | 10 | *Oral part of the exam* | Yes | 45 |
| *Written part of the exam* | Yes | 30 |
| Test (colloquium) | No | - |  |
| Exercise attendance | No | - |
| Term paper | Yes | 15 |
| Literature  |
| Ord | Author | Title | Publisher | Year |
| 1. | Šovljanski R., Lazić S. | Osnovi fitofarmacije | University of Novi Sad, Faculty of Agriculture | 2007 |
| 2. | Šovljanski R., Klokočar-Šmit Z., Lazić S. | Praktikum iz opšte fitofarmacije | University of Novi Sad, Faculty of Agriculture | 2002 |
| 3 | Inđić D., Vuković S. | Praktikum iz Fitofarmacije (fungicidi, zoocidi) | University of Novi Sad, Faculty of Agriculture | 2012 |
| 4 | Janjić V., Elezović I | Pesticidi u poljoprivredi i šumarstvu u Srbiji 2010 | Društvo za zaštitu bilja Srbije, Beograd  | 2010 |

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| Table 5.2 Course specification Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE 21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES **Agroecology and Environmental Protection**  |
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| Course: | *Integrated pest management* |
| Course id:3ОАG8О35 |
| Number of ECTS: 6 |
| Teacher: | PhD Stevan N. Masirevic, PhD Marija F. Zgomba; PhD Pero M. Strbac |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 4 | Practical classes: 2 | Other teaching types: / | Study research work: / | Other classes: / |
| Precondition courses | Passed exams: Passed exams from the first and second years, Biodiversity, Ecology of plant pathogenic microorganisms; Invasive organisms, Urban zoology, Urbanentomology, Sustainable Agriculture, Biological contamination, Agricultural Products, Pesticides 1, Pesticides 2 |
| 1. Educational goal

Introducing students with modern integrated measures for protection against of plant pathogenic microorganisms and pests, and possibilities without pesticides intervention in order to preserve the environment. |
| 1. Educational outcomes

The acquired knowledge will enable highly professional management of work in the field of environmental protection, conservation of ecosystems of plant pathogenic microorganisms and insects using the optimal combination of different measures. |
| 1. Course content

Theoretical classes: Introduction and importance of integrated care in preserving the environment. Definitions andunderstanding of the evolution of the integral protection measures. Understanding the factors that influence the population dynamics of pests and differences of natural and agro-ecosystems in order to obtain indicators for the type of strategies that should be brought into the program of integral protection. The integrated management of plant parasitic microorganisms, parasitic flowering plants and pests.Harmful and beneficial insects. The basic morphological characteristics, distributional patterns, harmfulness, biology and ecology of harmful pathogens and insects. Coherent strategy to reduce pest populations below the threshold in the light of rational zoocides application. Integral fighting measures (agricultural, mechanical, physical and biological). The place and role of copper compounds in integrated plant protection, the use of pheromones, growth regulators, bioproducts and synthesized organic insecticide. The application of genetic engineering.Practical classes:Introduction to the basic techniques of laboratory work with microorganisms that have antagonistic activity against plant pathogens. The use of pheromones in field conditions. Comparative effects of growth regulators and development of insects, bioproducts and synthesized organic insecticide. Processing data and analysis of results. Individual examination and identification of stuffed and preserved specimens and damage.Appearance of damage from harmful agents (pathogens, insects). The natural enemies of insects. |
| 1. Teaching methods

Teaching is carried out using modern techniques. Visual - didactic methods with the use of modern teaching aids and laboratory equipment.Practical classes - management of individual work of students and demonstrative - illustrative methods. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam (choose) | Mandatory | Points |
| Lecture attendance | Yes | 5 | *Oral part of the exam* | Yes | 40 |
| Test | Yes | 25 |  |
| Exercise attendance | Yes | 10 |
| Term paper | Yes | 10 |
| Laboratory works | Yes | 10 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Stojanovic S. | Poljoprivredna fitopatologija | Serbian Biological Society, Kragujevac | 2004 |
|  | Minks A.K., Gruys P. | Integreted control of insect pests in the Netherlands | Wageningen | 1980 |
|  | Dent D. | Insect Pest Management | CAB International, Wiltshire | 1991 |
|  | Strbac P., Camprag D. | Integrated pest management (cultural practices) and pests of field crops | Faculty of Agriculture, NoviSad | 2013 |
|  | Strbac P. | Pests of Stored Product and their Control. | Novi Sad: Feljton. | 2002 |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

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| --- | --- |
| Course: | *Ecotoxicology and Environmental Protection* |
| Course id:3OAG8O36 |
| Number of ECTS: 5 |
| Teacher: | Sanja D. Lazic, Ivana V. Maksimović, Vojislava P. Bursić, Marina I. Putnik- Delić |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 3 | Practical classes:1  | Other teaching types  | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

The knowledge about the pollution sources and types of pollutants in ecosystems and the measures to be taken in the process of agriculture production in order to prevent pollution of ecosystems.  |
| 1. Educational outcomes

The acquired-applicable knowledge in the field of ecotoxicology and environmental protection. |
| 1. Course content

Definition of ecotoxicology, circulation of matter and energy in nature, toxicity, toxicity testing, mutagens, cancerogenic, teratogenic, reproduction effects. Human expose to the toxic compounds and risk assessment. Pesticides – organochlorine insecticides, polychlorinated biphenyls, dioxins, polycyclic aromatic hydrocarbons. Concept, causes, types, level of pollution. Goals and assignments of agro-ecosystem protection. Basic characteristics and peculiarities of agro-ecosystem. Pollution and protection of air, water and soil– sources and classifications of pollutant, effects of pollution, possibilities of reducing negative effects in plant production.*Other teaching forms – laboratory exercises*: Determination of organochlorine insecticides, polychlorinated biphenyls and polycyclic aromatic hydrocarbons content in the environment. The determination of SO2, CO2, NH3 excess in air. Determination of inorganic and organic chemical pollution in water. Determination of heavy metals content in water, soil and plants and rebuilding polluted soil. Determination of nitrate content in plant material. |
| 1. Teaching methods: Lectures
 |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam (izabrati) | Mandatory | Points |
| Lecture attendance | Yes | 5 | *Theoretical part of the exam/Oral part of the exam/Written part of the exam-tasks and theory* | Yes | 85 |
| Test | No |  |  |
| Exercise attendance | No |  |
| *Term paper* | Yes | 10 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Kastori, R. | Zaštita agroekosistema | Feljton, Nov Sad | 1996 |
|  | Alloway, B., J. | Heavy metals in soil | Blackie, Glasgow | 1990 |
|  | Walker, C.H., Hopkin, S.P., Siblz, R.M., Peakall, D.B. | Principes of Exotoxicology | Tajlor&Francis, New York | 2006 |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecologyandenvironmental protection** |
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Elective

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| --- | --- |
| Course: | *Mathematics* |
| Course id: 3OAG1I39 |
| Number of ECTS: 6 |
| Teacher: | Snežana J. Matić-Kekić, Nebojša M. Dedović |
| Course status | Elective |
| Number of active teaching classes (weekly) |
| Lectures: 2 | Practical classes: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

Mastering the skills and knowledge of subject content, which provides the basis for mathematical modeling of agro-economic phenomena and their exploitation in practice. |
| 1. Educational outcomes

Student qualifies for mathematical modeling of agro-economic phenomena and actively pursuing them. |
| 1. Course content

Real functions. Linear, quadratic, exponential, logarithmic, trigonometric functions and degrees. Sequences and limits of the functions. Asymptote of the functions. Derivative of the function (first and higher order). Local extreme values and intervals of monotonicity. Concave and convex functions. Graphic of the functions. Economic functions: interval of profitability, profits, demand, supply, revenues, costs, flexibility in the point and its interpretation. Integral calculus: primitive functions, method of substitution, partial integration and the integration of rational functions. Application of definite integrals. |
| 1. Teaching methods: Lectures
 |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam  | Mandatory | Points |
| Lecture attendance | Yes | 5 | *Written part of the exam-tasks and theory* | Yes | 45 |
| Test | Yes | 45 |  |
| Exercise attendance | Yes | 5 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Konjik S., Dedović N. | Mathematics - a collection of tasks for the students of Faculty of Agriculture (in Serbian) | Faculty of Agriculture, University of Novi Sad | 2011. |
|  | Hadzić O., Takači Đ. | Mathematics for students of natural sciences (in Serbian) | University of Novi Sad, university textbooks - Edition 76 | 1998. |
|  | Matić-Kekić S. | Economic mathematics for students of biological sciences (in Serbian) | Faculty of Agriculture, University of Novi Sad | 2006. |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

|  |  |
| --- | --- |
| Course: | *Applied mathematics* |
| Course id: 3OAG1I40  |
| Number of ECTS: 6 |
| Teacher: | Snežana J. Matić-Kekić, Nebojša Dedović |
| Course status | Elective  |
| Number of active teaching classes (weekly) |
| Lectures: 2 | Practical classes: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

Mastering the skills and knowledge of subject content, which provides the basis for mathematical modeling of agro-economic phenomena and their exploitation in practice. |
| 1. Educational outcomes

Student qualifies for mathematical modeling of agro-economic phenomena and actively pursuing them. |
| 1. Course content

Financial mathematics: percentage and promil calculus, compounded interest rate, fixed-term and continuous savings, loans payment. Proportion, direct and inverse proportion, mixing calculus, chain calculus, division calculus, time series. Matrix calculus: operations on matrices, determinant of matrices, elementary transformation, regular matrices. Gaussian elimination method, Cramér's theorem, inverse matrix, simplex method, Vogel’s and MODI method. Formulation and solution of mathematical models. Combinatorial principles, combinations, variations and permutations, binomial coefficients.  |
| 1. Teaching methods: Lectures
 |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam  | Mandatory | Points |
| Lecture attendance | Yes | 5 | *Written part of the exam-tasks and theory* | Yes | 45 |
| Test | Yes | 45 |  |
| Exercise attendance | Yes | 5 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Konjik S., Dedović N. | Mathematics - a collection of tasks for the students of Faculty of Agriculture (in Serbian) | Faculty of Agriculture, University of Novi Sad | 2011. |
|  | Hadzić O., Takači Đ. | Mathematics for students of natural sciences (in Serbian) | University of Novi Sad, university textbooks - Edition 76 | 1998. |
|  | Matić-Kekić S. | Economic mathematics for students of biological sciences (in Serbian) | Faculty of Agriculture, University of Novi Sad | 2006. |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

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| --- | --- |
| Course: | *Informatics* |
| Course id:3OAG2I41 |
| Number of ECTS: 5 |
| Teacher: | Bojan M. Srdjevic, Tihomir S. Zoranovic, Bosko D. Blagojevic  |
| Course status | Elective |
| Number of active teaching classes (weekly) |
| Lectures: 2 | Practical classes: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

Acquiring base knowledge in informatics and information technologies for agriculture. |
| 1. Educational outcomes

Skills in informatics and using information technologies in agriculture. |
| 1. Course content

*Theory*Introduction. Discrete information and data. Digital computers. Hardware platforms (mainframes, supercomputers, personal computers). Hardware and software. Algorithms. Programming languages. Digital computers in agriculture. Information and communication technologies. Networks and protocols. Internet and services. Databases. Database management systems. Information systems in agriculture. Application software (linear programming, statistical methods and packages, transportation models, networks and resources allocation, decision making etc.).*Practice*Measuring quantities of information (Shannon' formula and Hartley's theorem). Numerical, alphabetical and alphanumerical environments of personal computers and systems (examples). Algorithms - examples. Computer languages overview. Web search and e-mail. Excample information systems in agriculture. Data organization (entities, classes, attributes and data, domains). Logical and physical organization of data in databases. Database management systems - overview. Software tools in agriculture with example applications. |
| 1. Teaching methods

Lectures, Practical classes |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 5 | Oral part of the exam | Yes | 40 |
| Exercise attendance | Yes | 5 |  |  |  |
| Colloquium x 2 | Yes | 2x25=50 |  |  |  |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Srdjevic B. | Informatics | Textbook, 226 pages  | 1996 |
| 2. | B.Srdjevic, T. Zoranovic | Informatics | Lectures posted at the web (selected topics); regularly updated |  |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

|  |  |
| --- | --- |
| Course: | *Applied Informatics* |
| Course id: 3OAG1I42 |
| Number of ECTS: 6 |
| Teacher: | Bojan M. Srdjevic, Tihomir S. Zoranovic, Bosko D. Blagojevic  |
| Course status | Elective |
| Number of active teaching classes (weekly) |
| Lectures: 2 | Practical classes: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

Acquiring base knowledge in applied informatics. |
| 1. Educational outcomes

Skills in applying knowledge of informatics in professional career. |
| 1. Course content

*Theory*Measuring quantities of information in one or more messages (Shannon' formula and Hartley's theorem). Discrete information. Mainframes, supercomputers, and personal computers. Operating systems, utilities and application software for PCs. Solving the problems with computer. Programming languages (procedural, descriptive, artificial intelligence, internet languages). Information technologies and multimedia. Computer networks. Internet, protocols and services. Databases. Cryptography. Identification of users and personal data protection. Information systems in agriculture (purposes, development and architectures). Functionalities. Database management systems and software. Application software in agriculture. Examples of utility services, application software, expert systems etc.*Practice*Application of Shannon' formula. Hartley's theorem and applications. PC architecture and characteristics. Discrete values and numeric (base numeric systems). Solving problems with computers. Algorithms (examples). Methods and procedures for solving typical engineering problems. Word processing and spreadsheets. Advanced software tools in agriculture. Examples of application: utilities, linear programming, statistical packages, transportation models, network models for resources allocation, decision support software. |
| 1. Teaching methods

Lectures, Practical classes |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 5 | Oral part of the exam | Yes | 40 |
| Exercise attendance | Yes | 5 |  |  |  |
| Colloquium x 2 | Yes | 2x25=50 |  |  |  |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Srdjevic B. | Informatics | Textbook, 226 pages  | 1996 |
| 2. | B.Srdjevic, T. Zoranovic | Informatics | Lectures on applied informatics posted at the web (selected topics); regularly updated |  |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

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| --- | --- |
| Course: | *Genetics* |
| Course id: 3OAG3I43 |
| Number of ECTS: 6 |
| Teacher: | D. Dimitrijević, prof. dr Sofija R. Petrović , Borislav M. Banjac, MSc |
| Course status | Elective |
| Number of active teaching classes (weekly) |
| Lectures: 2 | Practical classes: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

Acquiring the necessary knowledge in general genetics, pertaining to the laws of inheritance and the gene flow, methods of gene manipulation and creation of GMO through the methods of transgenic technology. |
| 1. Educational outcomes

Lessons learned in a course could be used in professional encounter with GMO, whose application is most present in agriculture and in the domain of resistance to weeds and pathogens. |
| 1. Course content

*Theoretical lectures:* Introduction. Biodiversity and its application in plant protection. Methods of propagation of plants and fertilization systems. Reproduction of microorganisms. The mechanisms of inheritance. Changes in the number and structure of chromosomes. Exploiting mutagenesis in plant protection. The genetic base of breeding for resistance to pathogens and insects. Hybridization as a method of creating a new genetic variability. The chromosome engineering. Horizontal gene transfer. Modern biotechnology and gene manipulation at the molecular level. The role of plant protection in seed production. *Practical teaching*: PT is conducted through practical exercises and seminars that follow TL. Gametogenesis and double fertilization in angiosperms. Reproduction of microorganisms. Genetic systems in the inheritance of traits. Extra nuclear inheritance. Changes in the number and structure of chromosomes. Mutations. The genetic basis of resistance to pathogenic organisms. The genetic bases of plant breeding and hybridization. Manipulation of chromosomes. Horizontal gene transfer. The manipulation of genes at the molecular level. The role of plant protection in seed production. |
| 1. Teaching methods:

Teaching is done using modern techniques. Theoretical part of the training is conducted in a Faculty lecture halls. All lectures are computer processed and presented. The practical part of the course takes place in cabinetmaking work in adapted air-conditioned room, with individual seats for students (40 seats), which is equipped with a computer, video beam, overhead projectors and microscopes. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam  | Mandatory | Points |
| Lecture attendance | Yes | 5 | *Written part of the exam* | Yes | 30 |
| Test | Yes | 30 | Oral exam | Yes | 30 |
| Exercise attendance | Yes | 2.5 |  |
| Seminar | Yes | 2.5 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Borojević S., Borojević K.  | Genetika  | Faculty of Agriculture, University of Novi Sad | 1976 |
|  | Borojević S. | Principi i metodi oplemenjivanja bilja  | Ćirpanov, Novi Sad |  1981 |
|  | Dimitrijević, Miodrag, Petrović, Sofija  | Genetika populacije. Adaptabilnost i stabilnost genotipa |  Poljoprivredni fakultet, Novi Sad, Naučni institut za ratarstvo i povrtarstvo, Novi Sad | 2005 |
|  | Milošević M., Ćirović, M., Mihaljev, I., Dokić, P.: | Opšte semenarstvo | Institut za ratarstvo i povrtarstvo, Novi Sad | 1996 |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

|  |  |
| --- | --- |
| Course: | *Genetics with Plant Breeding Fundamentals* |
| Course id: 3OAG3I44 |
| Number of ECTS: 6 |
| Teacher: | D. Dimitrijević, prof. dr Sofija R. Petrović , Borislav M. Banjac, MSc |
| Course status | Elective |
| Number of active teaching classes (weekly) |
| Lectures: 2 | Practical classes: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

The course is designed as a logical combination of general genetics and plant breeding fundamentals and aims to familiarize participants with the general principles of inheritance, transfer of genetic information and the creation of new genetic variability through general genetics fundamental studies, as well as the practical application through the basic principles and methods of plant breeding. |
| 1. Educational outcomes

Student should be given a basis on which could be able to upgrade their abilities through the master's and doctoral programs for scientific work, participation in breeding programs of organisms and for the economy, in all the jobs that require understanding of the functioning of the hereditary basis of organisms, as well as, genotype by environment interactions in order to obtain new economically exploitable genetic variability within breeding programs. |
| 1. Course content

*Theoretical lectures:* Introduction; Cell division; Modes of reproduction and fertilization systems in plants; Chromosomes and chemical bases of heredity; The mechanism of inheritance and hybridization; Changes in the number and structure of chromosomes; Mutations in plant breeding; Inbreeding and heterosis; Chromosomal and genetic engineering; The genetic base of breeding self-pollinated and cross-pollinated plants; The genetic base of breeding for resistance to pathogens and insects; Methods of selection of plants; Novel varieties releasing and production of certified seed*Practical teaching: Exercise, Other modes of teaching, Study research work:* Cell division and fertilization; The life cycle of eukaryotes and prokaryotes; Chromosomes; The structure and function of the gene; Gametogenesis; Independent gene segregations; The gene interactions; Genetic linkage and crossing over; *Species* and *genus* hybrids; Changes in the number of chromosomes; Changes in the structure of chromosomes; Inbreeding and heterosis; Population and quantitative genetics |
| 1. Teaching methods:

Teaching is done using modern techniques. Theoretical part of the training is conducted in a Faculty lecture halls. All lectures are computer processed and presented. The practical part of the course takes place in cabinetmaking work in adapted air-conditioned room, with individual seats for students (40 seats), which is equipped with a computer, video beam, overhead projectors and microscopes. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 5 | Written part of the exam | Yes | 30 |
| Test | Yes | 30 | *O*ral exam | Yes | 30 |
| Exercise attendance | Yes | 2.5 |  |
| Seminar | Yes | 2.5 |  |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Borojević S., Borojević K.  | Genetika  | Faculty of Agriculture, University of Novi Sad | 1976 |
|  | Borojević S. | Principi i metodi oplemenjivanja bilja  | Ćirpanov, Novi Sad |  1981 |
|  | Dimitrijević, Miodrag, Petrović, Sofija  | Genetika populacije. Adaptabilnost i stabilnost genotipa |  Poljoprivredni fakultet, Novi Sad, Naučni institut za ratarstvo i povrtarstvo, Novi Sad | 2005 |
|  | Kraljević-Balalić, M., Petrović, S. Vapa Lj.  | Genetika – teorijski osnovi sa zadacima | Poljoprivredni fakultet, Institut za ratarstvo i povrtarstvo i PMF, Novi Sad | 1991 |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

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| --- | --- |
| Course: | *English Language I* |
| Course id: 3OAG5I45 |
| Number of ECTS:6 |
| Teacher: | Bojana B. Komaromi, Aleksandar M. Jagrović, Igor Đ. Cvijanović |
| Course status | Elective |
| Number of active teaching classes (weekly) |
| Lectures: 2 | Tutorials: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

Acquiring and consolidating basic patterns of grammar, pronunciation, spoken and written language in order to educate students for the formal and informal communication in General English. Introducing students to basic specialist literature, i.e. basic terms and concepts in agriculture and the relevant study programme. |
| 1. Educational outcomes

Students will be capable of active usage of General English at the elementary, pre-intermediate or intermediate level in both spoken and written medium depending on the course level they attended (A1, A2 or B1 according to *Common European Framework of Reference for Languages*). Students will also be able to recognise and actively use basic specialist terms and concepts in agriculture and the relevant study programme.  |
| 1. Course content

Theoretical instruction**Phonetics**: Correction of students’ pronunciation, accent and intonation according to one of the standard dialects of the English language (British and/or American). **Morphology**: Nouns – plural, gender, genitive. Pronouns – personal, possessive, question, relative and reflexive. Adjectives – formation and comparison. Adverbs – Formation, place and comparison. Verbs – Forms, auxiliaries, modal verbs, tenses, gerund. **Syntax**: Word order, clauses, sentences, sentence organisation. **Lexical forms** – phrasal verbs, idioms, collocations and compounds. **Translation** – Bilingual translation: from Serbian into English and vice versa. Practical instructionSpoken language practice in practical everyday situations. Development of translation skills and techniques. Grammar activation in communication. Delivering specialist presentations in English.  |
| 1. Teaching methods

Lectures, tutorials, consultations. Working in small groups and pairs. Individual work with audio-visual equipment. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam  | Mandatory | Points |
| Lecture attendance | Yes/No | 10 | *Written exam**Oral exam* | Yes | 2030 |
| Test | Yes/No | 2 x 15 |  |
| Tutorials attendance | Yes/No | 10 |
|  | Yes/No |  |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Liz and John Soars, Amanda Maris | *New Headway Elementary*, 4th Ed | Oxford University Press | 2011 |
|  | Liz and John Soars, Amanda Maris | *New Headway Pre-Intermediate*, 4th Ed. | Oxford University Press | 2011 |
|  | Liz and John Soars, Amanda Maris | *New Headway Intermediate*, 4th Ed. | Oxford University Press | 2011 |
|  | Whitby N. | *Business Benchmark – BEC Preliminary* | Cambridge University Press, 6th Printing | 2009 |
|  | Gajić Ranka, | *English in Agriculture* | Naučna knjiga KMD, Beograd | 2005 |
|  | Murphy R. | *Essential English Grammar in Use, 3rd Ed.* | Cambridge University Press | 2010 |
|  | Murphy R. | *English Grammar in Use, 3rd Ed.* | Cambridge University Press | 2010 |

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| --- | --- |
| Course: | *HUNTING* |
| Course id:3OAG5I46 |
| Number of ECTS:6 |
| Teacher: | Prof. Dr Miloš BeukovićDr Dejan Beuković |
| Course status | Elective |
| Number of active teaching classes (weekly) |
| Lectures:2x15 | Practical classes:2x15 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

Education and training students for immediate work in hunting. After graduation, the student is able to develop and apply their knowledge of the field of hunting and hunting economy. |
| 1. Educational outcomes

The formation of professionals with academic qualifications who has significantly broadened and deepened knowledge necessary for understanding the scientific basis of hunting and hunting economy. Acquired knowledge of the studentcompleted undergraduate studies provides expertise to work in hunting and hunting economy. |
| 1. Course content

Introduction: Hunting as a science and profession. Hunting through the ages, a brief history of the development of hunting and hunting; Biologygame: Systematics game. The legal classification of wildlife and hunting; Planning and organization hunting management: Annual management plan. hunting ground term, quality, quality evaluation. Fenced hunting grounds, Zoo. Hunting and breeding centers; Cultivation of the game: Payment game breeding. Growing wild in farms (farms). Customizing game produced in farms for resettlement to the hunting grounds; Nutrition and game nutrition.- Basic features for the game. Nutrients nutrition game. Needs in nutrients and food for certain species of wildlife; Payment (techniques) hunting: The process of the harvested game. Capture and transport of wildlife. Hunting legislation, regulations and hunting ethics; Hunting weapons, ammunition and ballistics: History of development weapons. Types of hunting weapons and ammunition; Cynology: Dog Breeds. Cultivation of dogs, feeding, breeding, Training and disease; Game trophies: Preparation and processing of trophies. Evaluation of trophies. Hunting exhibitions; Conservation and wildlife diseasesBiology game: Recognizing game on slides and slides; Breading and organizations management: Elements of making hunting ground millstone, annual plan. Technique bonitation hunting grounds. The organization and technique of determining the number of game; Cultivation of the game: field work with the aim of familiarization with the manner of wildlife breeding, hunting areas, farms, farm wildlife, hunting and breeding technical facilities. Practical introduction to the types of weapons and ammunition; Cinology: Recognitiondog breeds on slides; Game trophies: Practical evaluation. |
| 1. Teaching methods

Lectures, Practice. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 10 | *Oral part of the exam* | Yes | 45 |
| Test | Yes | 30 |  |
| Exercise attendance | Yes | 15 |
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| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | John A. Bissonette | Wildlife and Landscape Ecology: Effects of Pattern and Scale | Springer Science & Business Media, | 1997 |
|  | Rory Putman, Marco Apollonio, Reidar Andersen | European Ungulates and Their Management in the 21st Century | Cambridge University Press | 2011 |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE 21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES **Agroecology and Environment Protection**  |
| Table 5.2 Course specification |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

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| --- | --- |
| Course: | *English Language II* |
| Course id: 3OAG6I47 |
| Number of ECTS:6 |
| Teacher: | Bojana B. Komaromi, Aleksandar M. Jagrović, Igor Đ. Cvijanović |
| Course status | Elective |
| Number of active teaching classes (weekly) |
| Lectures: 2 | Tutorials: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

Enhancing and perfecting basic patterns of grammar, pronunciation, spoken and written language in order to educate students for the formal and informal communication in General English. The consolidation, enhancement and activation of basic terms and concepts in agriculture and the relevant study programme. |
| 1. Educational outcomes

Students will be capable of active usage of General English at the elementary, pre-intermediate or intermediate level in both spoken and written medium depending on the course level they attended in English Language 1 (A1, A2 or B1 according to *Common European Framework of Reference for Languages*). Students will also be able to recognise and actively use basic specialist terms and concepts in agriculture and the relevant study programme.  |
| 1. Course content

Theoretical instruction**Phonetics**: Cnsolidation and perfection of the accent and intonation according to one of the standard dialects of the English language (British and/or American). **Morphology**: Verbs – Tenses, gerund, passive, conditional. Nouns – plural, gender, genitive. Pronouns – personal, possessive, question, relative and reflexive. Adjectives – formation and comparison. Adverbs – Formation, place and comparison. Verbs – Forms, auxiliaries, modal verbs, tenses, gerund. **Syntax**: Word order, clauses, sentences, sentence organisation. **Lexical forms** – phrasal verbs, idioms, collocations and compounds. **Translation** – Bilingual translation: from Serbian into English and vice versa. Practical instructionSpoken language practice in practical everyday situations. Development of translation skills and techniques. Grammar activation in communication. Delivering specialist presentations in English.  |
| 1. Teaching methods

Lectures, tutorials, consultations. Working in small groups and pairs. Individual work with audio-visual equipment. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam  | Mandatory | Points |
| Lecture attendance | Yes/No | 10 | *Written exam**Oral exam* | Yes | 2030 |
| Test | Yes/No | 2 x 15 |  |
| Tutorials attendance | Yes/No | 10 |
|  | Yes/No |  |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Liz and John Soars, Amanda Maris | *New Headway Elementary*, 4th Ed | Oxford University Press | 2011 |
|  | Liz and John Soars, Amanda Maris | *New Headway Pre-Intermediate*, 4th Ed. | Oxford University Press | 2011 |
|  | Liz and John Soars, Amanda Maris | *New Headway Intermediate*, 4th Ed. | Oxford University Press | 2011 |
|  | Whitby N. | *Business Benchmark – BEC Preliminary* | Cambridge University Press, 6th Printing | 2009 |
|  | Gajić Ranka, | *English in Agriculture* | Naučna knjiga KMD, Beograd | 2005 |
|  | Murphy R. | *Essential English Grammar in Use, 3rd Ed.* | Cambridge University Press | 2010 |
|  | Murphy R. | *English Grammar in Use, 3rd Ed.* | Cambridge University Press | 2010 |

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| --- | --- |
| Course: | *Genetically Modified Organisms* |
| Course id: 3OAG6I48 |
| Number of ECTS: 6 |
| Teacher: | D. Dimitrijević, prof. dr Sofija R. Petrović , Borislav M. Banjac, MSc |
| Course status | Elective |
| Number of active teaching classes (weekly) |
| Lectures: 2 | Practical classes: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

Acquiring the necessary knowledge in general genetics, pertaining to the laws of inheritance and the gene flow, methods of gene manipulation and creation of GMO through the methods of transgenic technology. |
| 1. Educational outcomes

Lessons learned in a course could be used in professional encounter with GMO, whose application is most present in agriculture and in the domain of resistance to weeds and pathogens. |
| 1. Course content

*Theoretical lectures:* Introduction. Biodiversity and its application in plant protection. Methods of propagation of plants and fertilization systems. Reproduction of microorganisms. The mechanisms of inheritance. Changes in the number and structure of chromosomes. Exploiting mutagenesis in plant protection. The genetic base of breeding for resistance to pathogens and insects. Hybridization as a method of creating a new genetic variability. The chromosome engineering. Horizontal gene transfer. Modern biotechnology and gene manipulation at the molecular level. The role of plant protection in seed production. *Practical teaching*: PT is conducted through practical exercises and seminars that follow TL. Gametogenesis and double fertilization in angiosperms. Reproduction of microorganisms. Genetic systems in the inheritance of traits. Extra nuclear inheritance. Changes in the number and structure of chromosomes. Mutations. The genetic basis of resistance to pathogenic organisms. The genetic bases of plant breeding and hybridization. Manipulation of chromosomes. Horizontal gene transfer. The manipulation of genes at the molecular level. The role of plant protection in seed production. |
| 1. Teaching methods:

Teaching is done using modern techniques. Theoretical part of the training is conducted in a Faculty lecture halls. All lectures are computer processed and presented. The practical part of the course takes place in cabinetmaking work in adapted air-conditioned room, with individual seats for students (40 seats), which is equipped with a computer, video beam, overhead projectors and microscopes. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 5 | Written part of the exam | Yes | 30 |
| Test | Yes | 30 | *O*ral exam | Yes | 30 |
| Exercise attendance | Yes | 2.5 |  |
| Seminar | Yes | 2.5 |  |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Borojević S., Borojević K.  | Genetika  | Faculty of Agriculture, University of Novi Sad | 1976 |
|  | Borojević S. | Principi i metodi oplemenjivanja bilja  | Ćirpanov, Novi Sad |  1981 |
|  | Dimitrijević, Miodrag, Petrović, Sofija  | Genetika populacije. Adaptabilnost i stabilnost genotipa |  Poljoprivredni fakultet, Novi Sad, Naučni institut za ratarstvo i povrtarstvo, Novi Sad | 2005 |
|  | Milošević, M., Ćirović, M., Mihaljev, I., Dokić, P. | Opšte semenarstvo  | Institut za ratarstvo i povrtarstvo, Novi Sad | 1996 |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

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| --- | --- |
| Course: | *Ecological biochemistry* |
| Course id:3OAG6I49 |
| Number of ECTS: 6 |
| Teacher: | Prof. dr Đorđe Malenčić |
| Course status | Elective |
| Number of active teaching classes (weekly) |
| Lectures: 2 | Practical classes: 2 | Other teaching types: student`s papers (seminar) | Study research work: - | Other classes: - |
| Precondition courses | None |
| 1. Educational goal

To gain knowledge on molecular aspects of ecological characteristics of cultivated and wild growing plants. Study on secondary biomolecules in plants and their metabolism. |
| 1. Educational outcomes

The contribution ofnew knowledgein the field ofEcologicalBiochemistry. |
| 1. Course content

Theory: Biochemical adaptations of plants to environment. Plant toxins and their effect on herbivores and pathogens. Hormonal interactions between plants and animals. Secondary biomolecules which attract and repell insects.Plant-vertebrates relationship, including humans. Static and induced plants defence mechanisms from predators.Defence substances: terpenoids, alkaloids, phenolics and quinones. Alelopaty. Biochemistry of the host-parasite relation. Higher plants-lower plants interaction.Biochemical basis of plant resistance to diseases. Phytoalexins and phytotoxins. The role of chemical signals in the intra- and inter-cellular communication. Reactive species of oxygen and nitrogen. Antioxidant systems in plants and oxidative stress.Molecular mechanisms of plant resistance to abiotic stress (radiation, extreme temperatures, water stress, drought, salination, heavy metals and pesticides). Resistance mechanisms of plants to biotic stress. Induced plant stress resistance. Practical classes: Determination of content and composition of essential oils from aromatic plants. Methods of identification of essential oils. Antimicrobial properties of essential oils. Isolation i determination of total alkaloids from fruits and seeds of hot paprika. Total carotenoids determination from carrot roots. Isolation and determination of the total phenolicsand tannins from different plant species. Determination of the total flavonoids using metal complex with AlCl3. Determination of phenolic pigments anthocyanins from flower petals. Hypersensitive response of plants to pathogen attack – determination of reactive oxygen species and lipid peroxidation. Field trip (collection of plant material for experimental work). |
| 1. Teaching methods

Lectures, Practical classes, Consultations, research work (optional) |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam (izabrati) | Mandatory | Points |
| Lecture attendance | Yes | 5 | Written part of the exam-tasks and theory | Yes | 60 |
| Exercise attendance | Yes | 5 |  |
| Test, Term paper | Yes | 30 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Dr Đorđe Malenčić, dr Milan Popović | Praktikum iz Biohemije biljaka (Plant biochemistry handbook) | Poljoprivredni fakultet, Novi Sad(Faculty of Agriculture, Novi Sad) | 2011. |
|  | Milan Popović, Đorđe Malenčić | Aktivni principi ukrasnog bilja (Active principles of ornamental plants) | Poljoprivredni fakultet, Novi Sad(Faculty of Agriculture, Novi Sad) | 2006. |
|  | Jeffrey B. Harborne | Introduction to Ecological biochemistry, 4th edition | Elsevier, London | 1994. |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE 21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Аgroecology and environment protection** |
| Table 5.2 Course specification |
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| --- | --- |
| Course: | *Modeling of living systems* |
| Course id: **3ОAG7I50** |
| Number of ECTS: 6 |
| Teacher: | prof. Dragutin T. Mihailović |
| Course status | Elective |
| Number of active teaching classes (weekly) |
| Lectures: 3 | Practical classes: 1 | Other teaching types: | Study research work: 1 | Other classes: |
| Precondition courses | All courses from the first two years of the study programme |
| 1. Educational goal

To teach students to understand: (a) how to create formal models and (b) what is relation between formal and natural systems. Also, the goal is to train students how to make simple models of living systems and of their populations that are of importance to ecological and/or laboratory research. In that way students will learn how to make predictive models in agricultural, medical and ecological research. |
| 1. Educational outcomes

Students who have both theoretical and practical knowledge in: usage of most common modeling tools and in theoretical principles of these tools. It means that they will have knowledge of: basic principles of metabolism functioning, of ecological interactions between organisms and how these interactions can be formally presented. Students will also gain knowledge in the chosen programming language which will enable them to eventually create new or modify existing models. |
| 1. Course content

*Theoretical classes:* Basic principles of metabolism functioning. Transformation of matter and energy. Inheritance and mechanisms of mutations. Principles of adaptations. Communication mechanisms and the problem of meaning in biological communication. Structured populations. Self-organization and emergence in living systems. Self-organization of metabolism. Self-organization of populations. Synchronization and its emergence in living systems. Basic principles of formal systems. How to create formal systems. Relation between formal and natural systems. Programming language as a formal system. Conceptual problems in modeling living systems. Basic concepts of chaos theory. Logistic equations. Abstract algebra in modeling living systems. Complex networks.*Practical classes:* Introduction to existing models of living systems: their classification and architecture. Training in using some of the models. Introduction to programming. Creation of the simple models. |
| 1. Teaching methods

Lectures, Consultations, Research work |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 10 | *Written part of the exam-tasks and theory* | Yes | 30 |
| Test | Yes | 20 |  |
| Exercise attendance | Yes | 10 |
| Term Paper | Yes | 30 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Kauffman, S.A. | The Origins of Order: self-organization and selection in evolution. | Oxford University Press | 1993 |
|  | Adamatzky, A., Komosinski, M. | Artificial Life Models in Software. | Springer-Verlag. London | 2005 |
|  | Wolkenhauer O, Wellstead P, Cho KH | Systems Biology | Portland Press | 2008 |
|  | Asby, W.R. | An Introduction to Cybernetics | Chapman & Hall, London | 1956 |
|  | Samarskii, A.A., Mikhailov, A.P. | Principles of Mathematical Modelling | CRC Press | 2002 |
|  | Farkas, M. | Dynamical Models in Biology. | Elsevier Inc. | 2001 |

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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE 21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES***Agroecology and Environmental Protection*** |
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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES**Agroecology and environmental protection** |
| Table 5.2 Course specification |

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| --- | --- |
| Course: | *Environmental impact assessment* |
| Course id: 3OAG7I51 |
| Number of ECTS:6 |
| Teacher: | Ph.D.,Anđelka Belić, Milica D. Vranešević  |
| Course status | Elective |
| Number of active teaching classes (weekly) |
| Lectures: 2 | Practical classes: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

The aim of the course is that students learn the methods and procedures for assessment of environmental impact, with the application of current legislation in this area. |
| 1. Educational outcomes

Students will gain knowledge on the assessment of environmental impact, the needs and possibilities of implementation and application of all elements of the assessment of the existing socio - economic conditions with existing legislation. |
| 1. Course content

*Theory lessons*: Environmental problems in the decision-making process. Environmental impact assessment as a planning factor. Historical development and the level of representation in the developed world and in developing countries. General principles and procedures of the various estimates of environmental impacts in different political and legislative systems. Definition and subject to the assessment of environmental impacts, needs for assessment, and service evaluation.Analysis of the pre- impact assessment: determining the nature of the activity and its objects, identification and involvement of stakeholders, identification of alternatives to be discussed, the identification of an important issue - relevant to the topic, defining areas ( scope ) and to make specific instructions.Direct Impact Research: the identification and description of the type and importance of consequences and impacts of the proposed activities of each alternative assessment of the significance of impacts, analysis of the resulting information and investigated alternatives, preparation of reports on the study of environmental impact. Elements of the content of the report.Period after research: a review of the report, use of information by individuals / groups responsible for making decisions on proposals, monitoring activities.*Practical classes*:Practical teaching focuses on the research object, process elements and areas of assessment of environmental impacts. For selected examples are considered necessary procedures applicable in our country, bearing in mind the level of development and legislation. |
| 1. Teaching methods

Lectures, presentations generated by computer. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam  | Mandatory | Points |
| Lecture attendance | Yes | 10 | Oral part of the exam | Yes | 50 |
| Test | Yes | 10 |  |
| Exercise attendance | Yes | - |
| Term paper | Yes | 30 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  |  | Agricultural Effects on Ground and Surface Waters | Proceedings of the International Conference, Alterra, Wageningen. | 2000 |
|  | Jones M. G. | Environmental Impact Assessment | IHE, Delft, | 1987 |