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**DOCUMENTATION FOR THE ACCREDITATION
OF THE STUDY PROGRAM
-DOCTORAL STUDIES-**

AGRICULTURAL SCIENCES

SYLLABUS BOOK

Sremska Kamenica, 2019

Course Title: Scientific research methodology		
Teacher(s): Dr Mira Pucarević – full professor; –Dr Dejana Panković - full professor; Dr Ljubinko Jovanović - full professor.		
Status: Obligatory, I Semester		
ECTS: 13		
Prerequisite: None		
The goal of the course: Introduction to basic methodological postulates, specifics of epistemology of scientific research, philosophical, general scientific and logical (special) research methods for collecting, analyzing and explaining scientific work (its structures and stages in the process of scientific research).		
The outcome of the subject: The outcome of the subject is that PhD students need to acquire methodological ability to use and critically analyze the scientific literature, independently design and perform scientific research, as well as to apply acquired knowledge. Furthermore, students should understand statistical analysis of multivariate data, master the skills of preparing multivariate data for analysis using statistical programs (SPSS, Design Expert), and independently select statistical methods for multivariate data analysis and to analyze the results obtained from the use of appropriate statistical procedures. Students should also master decision support systems using ExpertChoice and Analitica software, through which they will successfully solve the problems of scientific research.		
Syllabus: <i>Theoretical part</i> Logic and cognition. Science and scientific knowledge. The philosophical foundations of science. Objectives of the methodology of scientific research, its constituent parts. Epistemological basis of research. Objectives of the methodology of scientific research, its constituent parts. Epistemological basis of research. Philosophical, general and special methods of scientific research. Individual scientific methods. Techniques for collecting, processing and analyzing scientific material in research. Design and scientific research project. Stages in the scientific research process. Using multivariate procedures to process and analyze the data collected and decision support tools. Experiment planning. <i>Practical classes</i> Exercises are realized through SRW; Collection of results of previous research and search of databases (KOBSON).		
Literature: Petz, B. (1985): Osnovne statističke metode za nematematičare, Sveučilišna naklala liber (SNL), Zagreb. Koen, M., Nejgel, E. (1965): Uvod u logiku i naučni metod, Zavod za izdavanje udžbenika SRS, Beograd. Marković, M. (1994): Filozofski osnovi nauke, BIGZ, Beograd. Mejovšek, M. (2008): Metode znanstvenog istraživanja, Naklada SLAP, Zagreb. Milosavljević, S. (1980): Istraživanje političkih pojava, Institut za političke studije, Beograd. Šamić, M. (1977): Kako nastaje naučno djelo, Svjetlost, Sarajevo. Šešić, B. (1980): Opšta metodologija, Naučna knjiga, Beograd. Mary Renck Jalongo, Olivia N. Saracho (2016): Writing for Publication Transitions and Tools that Support Scholars' Success. ISSN 2366-7672 ISSN 2366-7980 (electronic) Springer Texts in Education. ISBN 978-3-319-31648-2 ISBN 978-3-319-31650-5 (eBook). DOI 10.1007/978-3-319-31650-5. https://educons.edu.rs/studenti/e-biblioteka/		
No. Active lectures 10	Theoretical lectures: 3	Student research work: 7
Teaching methods: The teaching process is conducted through lectures and study research work. The study research work is auditory and during it the tasks from individual chapters are solved, additional explanations are provided and theoretical topics are elaborated on by examples. Examination is done through making a project assignment on a selected topic and through final exam.		
Score for grading (maximal 100 points) Activity during lectures – 10 points; Regularity at SIR - 10 points; Project assignment - 40 points; Oral examination – 40 points.		

Course Title: Quantitative methods		
Teacher(s): Dr Ljiljana Cvetković – full professor; dr Vladimir Grupčev – assistant professor		
Status: Obligatory, I Semester		
ECTS: 15		
Prerequisite: none		
The goal of the course: The main objective of the course is to enable students to think abstractly and to acquire basic knowledge in statistical modeling and their applications. Also, the aim of the course is to develop a special way of thinking for students when studying phenomena in the field of environmental protection. The character of the course is applicable, so the special attention is given to knowledge that can clarify the quantitative approach to problems in the field of the study. Furthermore, the goal of t course is to equip the student to select the appropriate statistical model as well as to use statistical packages (Statistica, etc.).		
The outcome of the subject: Enabling students to create and solve statistical models and apply the acquired knowledge in other subjects and problems in practice.		
Syllabus: <i>Theoretical part</i> The lectures are performed in combination. The lectures present the theoretical part of the subject and examples that serve to facilitate the understanding of the theory presented. Areas covered: basic concepts of probability theory (definition of probability, random variables of discrete and continuous type); numerical characteristics of the sample and population (mean values, measures of variation, measures of shape); interval parameter estimates (confidence interval for proportion, mean and dispersion); hypothesis testing (population mean hypotheses and population percentage hypotheses); regression and correlation (matrix form of regression model, multiple regression and correlation, curvilinear regression); dispersion analysis (single classification and double classification). <i>Practical classes</i> Using Statistica 8.0 software package.		
Literature: S. Hadživuković (1989): Statistika, Privredni pregled, Beograd. S. Hadživuković (1975): Tehnika metoda uzorka, Naučna knjiga, Beograd. M. Stojaković (2007): Verovatnoća, statistika i slučajni procesi, FTN, Novi Sad. V. Barnett (2004): Environmental Statistics: Methods and Applications, Wiley. F.M. Dekking, C. Kraaikamp, H.P. Lopuhaä, L.E. Meester (2007): A modern introduction to probability and statistics: understanding why and how (springer texts in Statistics), Springer. https://educons.edu.rs/studenti/e-biblioteka/		
No. Active lectures: 10	Theoretical lectures: 4	Student research work: 6
Teaching methods: Lectures, consultations, individual and group work.		
Score for grading (maximal 100 points) Project outline - 20 points Project design - 50 points Final Exam - 30 points.		

Course Title: Methods in Agrobiotechnology		
Teacher(s): Dr Ljubinko Jovanović - full professor, dr Dejana Panković – full professor; dr Gordana Racić – assistant professor; dr Danka Radić - assistant professor		
Status: Obligatory, II Semester		
ECTS: 11		
Prerequisite: None		
The goal of the course: The main objective of the course is acquiring knowledge in the field of the application of modern biotechnological methods in sustainable agriculture. In addition to gaining basic knowledge in genomics, the goal is to get more insight in biotechnological methods used to increase plant resistance to biotic and abiotic stresses, which are the most common causes of reduced plant production. Also, students will acquire the skills to identify main groups of microorganisms relevant for agriculture and basic techniques for their identification.		
The outcome of the subject: Training of students for practical application of modern biotechnological methods in agriculture, handling certain new instrumental methods and adopting a multidisciplinary approach in solving basic problems in agriculture.		
Syllabus: <i>Theoretical part</i> Plant genomics. Comparison of conventional and molecular plant breeding. Marker assisted selection. Application of tissue culture and micropropagation of plants. GMOs and genome editing. Analysis of classical microbiological methods. Rapid tests for detection of microorganisms. API tests and their application. Molecular identification of soil microorganisms. Biodiversity of microorganisms in the environment. The influence of environmental factors on changes in the composition of microbial communities. Influence of agro-technical measures on changes in the composition of microbial communities in soil and water. The influence of contamination with heavy metals, pesticides and other toxic substances on the composition of microbial communities in the environment. <i>Practical classes</i> Microbiological soil analysis. Isolation of microorganisms from soil. Polymerase Chain Reaction, PCR. Electrophoresis.		
Literature: Čurčić Nataša, Panković Dejana (2011): Gajenje genetički otpornih biljaka prema bolestima u cilju zaštite životne sredine. Monografija, 101 str., ISSN/ISBN978-86-87785-34-2, COBISSSR-ID267537671, Univerzitet Educons, Štampa Atelje Sremska Kamenica. Simonović Ana (2011): Biotehnologija i genetičko inženjerstvo biljaka, 401 str., NNK internacional, Beograd. Savić Pavićević Dušanka, Matić Gordana (2011): Molekularna biologija 1,364 str. NNK internacional, Beograd New Techniques in Agricultural Biotechnology (2017): Explanatory Note 02. High Level Group of Scientific Advisors. https://ec.europa.eu/research/sam/pdf/topics/explanatory_note_new_techniques_agricultural_biotechnology.pdf , ISBN 978-92-79-66222-5, doi:10.2777/574498, KI-02-17-242-EN-N		
No. Active lectures: 8	Theoretical lectures: 4	Student research work: 4
Teaching methods: All teaching process is interactive and multimedial, including powerpoint presentations. Presentations of students' seminar papers are an integral part of the teaching process, then the works of students involved in different topics, lectures by experts from the country and abroad, which contributes to an even better understanding of the complexity of the subject. The practical part of the teaching is through laboratory exercises in groups, watching and discussion of film material and consultation.		
Score for grading (maximal 100 points) Project outline - 20 points. Project development - 50 points. Final exam – 30 points.		

Course Title: SIR1 (NIR1) DD1		
Teacher(s): Mentor		
Status: Obligatory, II semester		
ECTS: 10		
Prerequisite: None		
The goal of the course: The student is trained to deal with important phenomena, mechanisms and relationships in the field of agricultural science and practice. Also, it is trained to form an analytical approach in solving them, with the ultimate goal of training for scientific research, publication and presentation of the results and independent preparation of a doctoral dissertation.		
The outcome of the subject: The student is qualified for independent scientific research work in the field of agriculture, for publication and public presentation of the results as well as for independent preparation of a doctoral dissertation.		
Syllabus: The student gets acquainted with the research methodology in the field of agriculture, the principles of conducting field experiments and the specifics of laboratory work. In consultation with the mentor, the student defines the field of research and the topic of the paper. After that, the student approaches the invention of literature review and selection of relevant sources in the field from which it chose to do doctoral dissertation.		
Literature: Relevant national and international sources (monographs, books, scientific and professional papers) in the field to which the topic of the paper belongs.		
No. Active lectures: 4	Theoretical lectures: 0	Student research work: 4
Teaching methods: Literature review, experimental work, consultations with a mentor and other professors dealing with research and theory in the field of the topic of the doctoral dissertation.		
Score for grading Study research work is not evaluated numerically but only descriptive: mastered/did not master.		

Course Title: Application of non-destructive technologies in modern agriculture		
Teacher(s): Dr Ljubinko Jovanović - full professor, dr Dejana Panković – full professor; dr Gordana Racić – assistant professor; dr Danka Radić - assistant professor		
Status: Subject from Elective Group 1, II Semester		
ECTS: 11		
Prerequisite: None		
The goal of the course: The aim of the course is to acquire knowledge in modern scientific approaches in the application of non-destructive technologies in agriculture.		
The outcome of the subject: At the end of the course, the student should be able to understand application of various computerized portable instruments for research in the field of sustainable agriculture. Also, they should be able to apply digital technologies (artificial intelligence, robotics, satellite imageries, drones, sensors, probes, etc.) in agriculture in order to continuously monitor agricultural production areas.		
Syllabus: <i>Theoretical part</i> Application of digital technologies in agriculture: satellite imaging, drones, sensors, probes and computer programs related to modern technologies. Application of non-destructive methods (FTIR, XFR, Raman spectroscopy) and computerized portable instruments in agriculture (various sensors for measuring pH, metal content in soil and water, humus content, NPK, microbial activity, pigment content in the leaf). <i>Practical classes</i> Laboratory tests combined with interactive teaching.		
Literature: Scientific articles, reviews Lojo A., Ponjavić M. (2004): GIS u gazdovanju prirodnim resursima, Gaus, Tuzla. Application Guidelines of GIS Alexey Chalimov (2020): Iot in agriculture: 8 technology use cases for smart farming and challenges to consider. https://easternpeak.com/blog/iot-in-agriculture-technology-use-cases-for-smart-farming-and-challenges-to-consider/ https://educons.edu.rs/studenti/e-biblioteka/		
No. Active lectures: 8	Theoretical lectures: 3	Student research work: 5
Teaching methods: All teaching process is interactive and multimedial, including powerpoint presentations. Presentations of students' seminar papers are an integral part of the teaching process, works of students involved in different topics, lectures by experts from the country and abroad, which contributes to an even better understanding of the complexity of the subject. The practical part of the teaching is through laboratory exercises in groups, watching and discussion of film material and consultation.		
Score for grading (maximal 100 points) Seminar work - 30 points; Case study - 20 points; Exam - 50 points.		

Course Title: The impact of climate change on agricultural production		
Teacher(s): Dr Olivera Nikolić - associate professor; dr Ljubinko Jovanović – full professor; dr Mirjana Bojović - assistant professor.		
Status: Subject from Elective Group 1, II Semester		
ECTS: 11		
Prerequisite: None		
The goal of the course: The main objective of the course is to understand the complexity of the relationship between agriculture and environment, and, consequently, climate change. Through the analysis of the causes of climate change and their impact on the growth and development of plants and agricultural production, the aim is to identify the mechanisms of their interactions and the possibilities of overcoming or mitigating the risks arising from such interactions.		
The outcome of the subject: Implementation of a multidisciplinary approach in order to solve basic problems in agriculture concerning the negative impact of climate change on agricultural production. Also, the outcome of the subject is to enable students to learn about the effects of plant-atmosphere interactions that they can apply in defining adaptive measures and models to respond more effectively to possible risks in agriculture.		
Syllabus: <i>Theoretical part</i> Agriculture and ecological factors. Climate distribution. Climate elements and factors. Climate classification. The impact of climatic factors on plant growth and development (photosynthesis, respiration, water uptake). The impact of climate factors on the appearance of plant diseases and pests. Climate change - causes, consequences. Natural and anthropogenic causes of climate change. Climate change trends. Possible impact of climate change on agricultural production - projections. The impact of agriculture on climate change - greenhouse gases, methane and nitrous oxide emissions. Global warming and agricultural production. Specific risks in agriculture. Impact of drought, as a consequence of climate change, on physiological processes in plants and mechanisms of overcoming stress. Floods, as a consequence of climate change, and agricultural production. The spread of disease and pests, as a result of climate change, and agricultural production. Adaptive measures in agriculture and adaptation to climate change risks. Legal framework necessary to reduce the causes of climate change and mitigate its effects on the environment and agricultural production - EU policy and national policy. <i>Practical classes</i> Experiments in controlled conditions. Climatic data analysis as well as the analysis of the effects of climate change.		
Literature: Mihailović, D.T., Lalić, B., Arsenić, I. (2009): Meteorology (workbook), Faculty of agriculture, Novi Sad, pp. 52 Tošić I., Unkašević M. (2013): Climate change in Serbia, Akademska misao, Belgrade, pp. 160 http://www.seerural.org/wp-content/uploads/2009/05/01_KLIMATSKE-PROMENE-Izazovi-za-poljoprivredu.pdf Stikić, R., Jovanović, Z. (2012): Plant stress physiology, Faculty of agriculture, Belgrade, pp. 27 Vahdati, K., Leslie, C. (Eds.). (2013): Abiotic stress: plant responses and applications in agriculture. BoD–Books on Demand. Arora, N.K. Impact of climate change on agriculture production and its sustainable solutions. Environmental Sustainability 2, 95–96 (2019). https://doi.org/10.1007/s42398-019-00078-w FAO. 2019. Agriculture and climate change – Challenges and opportunities at the global and local Level – Collaboration on Climate-Smart Agriculture. Rome. ISBN 978-92-5-131281-0 https://educons.edu.rs/studenti/e-biblioteka/		
No. Active lectures: 8	Theoretical lectures: 3	Student research work: 5
Teaching methods: The teaching process is performed interactively and via multimedia, including power point presentations.		
Score for grading (maximal 100 points) Seminary work - 30 points; Case study – 20 points; Exam - 50 points.		

Course Title: Sustainable use, protection and recovery of natural resources		
Teacher(s): Dr Ljubinko Jovanović – full professor; dr Dragana Dražić – principal research fellow; dr Danka Radić – assistant professor.		
Status: Subject from Elective Group 2, III Semester		
ECTS: 11		
Prerequisite: none		
The goal of the course: The main objective of the course is to familiarize students with the principles of long-term maintenance of the quality of natural resources in various production systems, as well as measures for their protection and recovery.		
The outcome of the subject: By attending the course program,, students will have considerable knowledge of use, protection and recovery of natural resources. Also, through study research work, they will acquire practical skills in this field.		
Syllabus: <i>Theoretical part</i> The concept and classification of natural resources; Soil quality management as a basis for improving productivity and soil quality; Parameters important for maintaining soil quality: organic matter, preserving soil structure, optimum use of pesticides and mineral fertilizers, soil compaction (optimal water-air regime); Parameters important for maintaining water quality: physical, chemical and biological quality indicators; Biodiversity: the role of plant belts; Biobarriers for water protection against pollutants; The role of crop rotation in improving soil quality; The role of plant residues and land cover for long-term maintenance of soil fertility. Multiple role of soil in the environment. Soil quality indicators (physical, chemical, biological); The cycles of nutrients in the soil. Methods of repairing the damaged soil, remediation techniques (phytoremediation and bioremediation). <i>Practical classes</i> Involvement in defining soil quality indicators, soil repair through practical and research work.		
Literature: Snežana Oljača (2010): Agroekologija. Foreign and domestic literature (journal articles, presentations from the Internet). Ratknić, M., eds (2007): Pošumljavanje goleti i antropogeno oštećenih zemljišta, Institut za šumarstvo, Beograd. https://educons.edu.rs/studenti/e-biblioteka/		
No. Active lectures: 9	Theoretical lectures: 4	Student research work: 5
Teaching methods: All the teaching process is interactive and multimedial, including powerpoint presentations. An integral part of the teaching process is the presentation of the students 'seminar papers, as well as the students' papers that are involved in the processing of various topics and lectures of experts from the country and abroad, which contributes to an even better understanding and understanding of the complexity of the subject. The practical part of the teaching is reflected through the laboratory exercises in groups, watching and discussing film materials and consulting.		
Score for grading (maximal 100 points) Activity during the class - 10 points; Practical classes - 10 points; Colloquiums - 20 points; Seminar papers - 20 points; Oral exam - 40 points.		

Course Title: Marketing strategies in ecological agriculture		
Teacher(s): Dr Diona Đurđević - associate professor, dr Bela Muhi - associate professor, dr Dejan Supić – assistant professor		
Status: Subject from Elective Group 2, III Semester		
ECTS: 11		
Prerequisite: None		
The goal of the course: The goal of this course is to introduce students to marketing strategies in today's market, enabling students to understand the importance and role of marketing strategies in ecological agriculture, and to understand the concept of marketing management and specific strategies that would enable the creation of attractive market offer to successful positioning in the market and long-term growth in the field of ecological agriculture.		
The outcome of the subject: Understanding the role and importance of marketing strategies in ecological agriculture and training of students for independent application of the concept of marketing management through the development and implementation of marketing strategies that should enable successful and long-term market position of ecological agriculture products.		
Syllabus: <i>Theoretical part</i> Preliminary considerations - marketing strategies and modern market; The role and importance of marketing strategies in ecological agriculture; Understanding of marketing management; Strategies of obtaining marketing information; Connecting with customers on the market of agricultural products; Strategy of building strong brands in the field of ecological agriculture; Shaping of market offer products of ecological agriculture; Strategies of delivering value; Strategies communication value; Creating of successful long-term growth in ecological agriculture. <i>Practical classes</i> Writing of the accession paper, project.		
Literature: 1. Kotler Philip, Keller Kevin (2006): Marketing management, Data status, Beograd. 2. Kotler Philip (2007): How to Create, Win, and Dominate Markets, Asee , Novi Sad. 3. Гргар Диона (2011): Како постати конкурентан?, Задужбина Андрејевић, Београд; 4. Kotler Philip, Wong Veronica, Saunders John, Armstrong Gary (2007): Principles of Marketing, Mate, Beograd. https://educons.edu.rs/studenti/e-biblioteka/		
No. Active lectures: 9	Theoretical lectures: 4	Student research work: 5
Teaching methods: Lectures, tutorials, case studies, independent and study work, dialogue method, discussion groups		
Score for grading (maximal 100 points) Project outline – 20 points. Project development – 50 points. Written and oral presentation of the project - 30 points.		

Course Title: SIR2 (NIR2) DD1		
Teacher(s): Mentor		
Status: Obligatory, III semester		
ECTS: 10		
Prerequisite: None		
The goal of the course: The student is trained for scientific research work, implementation of appropriate research methods and data analysis, publication and preparation of results and independent preparation of doctoral dissertation in the field of agricultural sciences.		
The outcome of the subject: The student is qualified for scientific research work, public publication and presentation of results and independent preparation of a doctoral dissertation.		
Syllabus: The content of the course is harmonized with the topic and needs of doctoral dissertation. The student gets acquainted with the research methodology in the field of agriculture, the principles of performing field experiments and the specifics of laboratory work in the field from which it chose to work on its doctoral dissertation, and conducts the same. The student reviews the scientific and professional literature from the area in which it is working on its doctoral dissertation.		
Literature: Relevant national and international sources (monographs, books, scientific and professional papers) in the field to which the topic of the paper belongs.		
No. Active lectures: 4	Theoretical lectures: 0	Student research work: 4
Teaching methods: Literature review, experimental work, data processing and preliminary analysis, in consultation with the professor who directly manages the preparation of the doctoral dissertation.		
Score for grading Study research work is not evaluated numerically but only descriptive: mastered/did not master.		

Course Title: Soil and water quality maintainace		
Teacher(s): Dr Gordana Racić - assistant professor, dr Danka Radić - assistant professor		
Status: Obligatory, III Semester		
ECTS: 6		
Prerequisite: None		
The goal of the course: The objective of the course is to acquire knowledge about soil and water quality as natural resources, which are of great importance in agriculture. As well as, improving knowledge in maintaining soil quality with application of microorganisms and their significant role in the rhizosphere and processes of organic matter transformation and about importance and types of mycorrhizae in soil.		
The outcome of the subject: Students are expected to be able to understand the importance of long-term conservation of soil and water, the application of microorganisms and their importance plants supply with nutrients, as well as understanding the importance of the practical application of plant growth and mycorrhizal bacteria in agricultural production. The students should be trained in critical analysis, presentation of acquired knowledge and transfer of knowledge, evaluation of teaching and learning outcomes.		
Syllabus: <i>Theoretical part</i> Soil as a natural resource. Basic functions of soil. Factors that affect the natural fertility of agricultural arable soil. Soil structure - methods and means of repair and maintenance. Legislation and directives for preventing soil degradation. Soil protection measures. Remediation and reclamation of contaminated and damaged soils. Physical, chemical and microbiological characteristics of the rhizosphere. Rhizosphere and microorganisms. Basic characteristics and types of mycorrhizae. Application of soil microorganisms in agriculture. Water as a natural resource. Impact of the water regime on the environment, occurrence and frequency of floods, occurrence and impact of droughts. Methods for hydrologic assessment of high water occurrence and flood risk. Flood protection and impact on ecosystems. European Water Directive; national water policy and regulation. <i>Practical classes</i> Laboratory practice in combination with interactive teaching process		
Literature: Vijay Singh Meena (2018): Role of Rhizospheric Microbes in Soil, Springer Singapore, 2019. Simonovic S. (2009): Managing Water Resources: Methods and Tools for a Systems Approach, UNESCO Publishing Scientific articles and reviews from the sci list https://educons.edu.rs/studenti/e-biblioteka/		
No. Active lectures: 7	Theoretical lectures: 4	Student research work: 3
Teaching methods: Interactive and multimedial, including powerpoint presentations. An integral part of the teaching process is the presentation of students 'seminar papers, then the students' papers that are involved in the processing of various topics, lectures of experts from the country and abroad, which contributes to better understanding of the complexity of the subject. The practical part will be carried out through laboratory exercises in groups, viewing and discussion of film material and consultations.		
Score for grading (maximal 100 points) Oral exam - 50 points. Written exam - 20 points. Seminar papers - 30 points.		

Course Title: Agriculture and food safety		
Teacher: Dr Milica Živkov Baloš - principal Research Fellow		
Status: Subject from Elective Group 3, IV Semester		
ECTS: 11		
Prerequisite: None		
The goal of the course: The main objective of this course is to introduce students to acquire knowledge and the principles of production of food of animal origin, with special emphasis on risks to food safety.		
The outcome of the subject: The student will be able to understand and be able to practically apply the basic principles of production of quality and safe food of animal origin. Students will be able to identify biological, chemical and physical hazards important for the safety of food of animal origin, as well as to properly analyze and evaluate them, after mastering the subject of the program and contents.		
Syllabus: <i>Theoretical part</i> Specific features in animal nutrition; nutrients and other substances in the diet of domestic animals; digestibility and absorption of nutrients and other substances; essentiality and metabolism of nutrients; substances in the food chain - soil, plant, animal; nutrient sources in animal nutrition; the impact of nutrition on the quality of products of animal origin (milk, meat, eggs, honey); the impact of farm management on the quality and safety of food of animal origin; contaminants of food of animal origin; the application of analytical tools in assessing the safety of food of animal origin; regulations governing the quality and safety of feed and food of animal origin; <i>Practical classes</i> Farm and laboratory research; training in writing papers in this field		
Literature: Dragan Glamočić, Igor Jajić, Mirko Ivković (2019): Osnovi ishrane domaćih životinja, prof., Univerzitet u Novom Sadu, Poljoprivredni fakultet, Novi Sad. Vlado Teodorovići Mirjana Dimitrijević (2011): Hemijski i fizički zagađivači namirnica animalnog porekla. Naučna KMD Beograd; ISBN 978-86-6021-034-2 Food Safety Management 1st Edition (2013): editors Yasmine Motarjemi, Huub Lelieveld Naučno istraživački radovi iz oblasti bezbednosti i kvaliteta hrane https://educons.edu.rs/studenti/e-biblioteka/		
No. Active lectures: 8	Theoretical lectures: 4	Student research work: 4
Teaching methods: Lectures, consultations and independent work		
Score for grading (maximal 100 points) Oral exam - 50 points; Written exam - 20 points; Seminar papers - 30 points.		

Course Title: Plant agrogenetic resources and breeding		
Teacher(s): Dr Perovic Dragan - full professor, dr Pankovic M. Dejana - full professor		
Status: Subject from Elective Group 3, IV Semester		
ECTS: 11		
Prerequisite: None		
The goal of the course: The goal of course is to provide doctoral students advanced knowledge of a plant agro genetic resource, their conservation as well as the conventional and molecular methods and techniques for their utilization in breeding for conventional agriculture and organic production. The aim of this course is to provide students the knowledge about the importance of plant diversity and its preservation from further erosion, to learn how these resources can be used to create variety of crops for conventional and organic production.		
The outcome of the subject: After the students successfully completed the pre-exam and exam commitments doctoral candidate will possess advanced theoretical and practical knowledge about the utilization of plant agro genetic resources in breeding for organic agriculture. An important aspect of this course is to examine the biological diversity and diversity within the various species and between species and ecosystems, on the one hand is an important resource for sustainable development on the other hand supplies farmer's organic farming appropriate varieties and lines.		
Syllabus: <i>Theoretical study</i> Theoretical study involves acquiring knowledge about the domestication of cultivated species, original and modern selection as the main source of erosion of genetic variability. Doctoral students further expand their knowledge of plant gene bank, their history and current trends in their work, as well as methods of conservation: <i>ex situ</i> and <i>in situ</i> conservation and on-farm conservation. The emphasis is on pre-breeding in and use of molecular markers in the target selection of varieties for conventional and organic production. Methods to triage genotypes with desirable traits at phenotypic and genotypic level in different types of plant agro genetic resource share are such as the local population, old and new varieties and wild relatives of cultivated plants are designed for theoretical and practical training. <i>Practical classes</i> Practical lessons include laboratory exercises that include phenotypic and genotypic evaluation of plant genetic collections and segregating populations on the selected example (study case)		
Literature: Borojević, S. (1981): Principi i metode oplemenjivanja biljaka. Radivoj Ćirpanov, Novi Sad, 387 str. Penčić, M. (2005): Biljni genetički resursi: izabrani radovi. Jugoslovenska inženjerska akademija. Beograd. Prodanović, S., Šurlan-Momirović, G. (2006): Genetički resursi biljaka z aorgansku poljoprivredu. Poljoprivredni fakultet, Beograd FAO (2010): The Second Report on the State of the World's Plant Genetic Resources for Food and Agriculture. Rome; ISBN 978-92-5-106534-1, 1-370 https://educons.edu.rs/studenti/e-biblioteka/		
No. Active lectures: 8	Theoretical lectures: 4	Student research work: 4
Teaching methods: Teaching process consists of lectures, excercises, consultations and seminar papers.		
Score for grading (maximal 100 points) Activity during lectures – 10 points; Practical classes – 10 points;		

Colloquia – 20 points;
Seminars - 20 points;
Oral examination – 40 points.

Course Title: Contemporary concepts of farm and domestic animals		
Teacher(s): Dr Rašić Slađan - assistant professor, dr Mihailo Radivojević - assistant professor		
Status: Subject from Elective Group 4, IV Semester		
ECTS: 12		
Prerequisite: None		
The goal of the course: Introducing students to the peculiarities of the physiology of digestion of farm and domestic animals, requirements for certain nutrients, the specifics of feeds, contemporary methods of assessing the quality of feeds, contemporary principles of ration formulation and the most important pathophysiological disorders of alimentary nature.		
The outcome of the subject: Students will gain the necessary scientific knowledge to effectively organize the feeding of domestic and farmed animals with genetic potential for the highest level of expression of production traits.		
Syllabus: <i>Theoretical study</i> Introduction to basic needs of domestic and farm animals in carbohydrates and proteins, fats and other nutrients, their adoption and their metabolic paths, as well as influence on production and reproductive properties, health status, as well as the quantity and quality of final products. <i>Practical classes</i> Familiarity with the various methods and analytical procedures for determining the quality of food for domestic and farmed animals, as well as the principles of nutrition monitoring and evaluation.		
Literature: Mihailo Radivojević (2016): Ishrana domaćih životinja, Univerzitet Edukons, Sremska Kamenica. McDonald, P., Edwards, R.A., Greenhalgh, J.F.D., Morgan, C.A., Sinclair, L.A. (2010): Animal Nutrition, Acribia, National Research Council (2001): Nutrient Requirements of Dairy Cattle - Seventh Revised Edition, Washington, DC: The National Academies Press. National Research Council (2001): Nutrient Requirements of Beef Cattle - Seventh Revised Edition: Update 2000, Washington, DC: The National Academies Press. Inostrani i domaći časopisi i zbornici radova, posvećeni savremenim konceptima ishrane domaćih i gajenih životinja. National Research Council (2012): Nutrient Requirements of Swine: Eleventh Revised Edition. Washington, DC: The National Academies Press. National Research Council (2007): Nutrient Requirements of Horses: Sixth Revised Edition. Washington, DC: The National Academies Press. https://educons.edu.rs/studenti/e-biblioteka/		
No. Active lectures: 9	Theoretical lectures: 4	Student research work: 5
Teaching Methods Lectures using all audio visual aids. Practical work in the laboratory, introduction to contemporary analytical methods of feed testing, methods of evaluation of nutrition under real conditions on the farm.		
Score for grading (maximal 100 points) Activity during the class - 10 points;		

Practical classes - 10 points;
 Colloquiums - 20 points;
 Seminar papers - 20 points;
 Oral exam - 40 points.

Course Title: Biofarm – source of high value agricultural products
Teacher(s): Dr Olivera Nikolić - associate professor; dr Rašić Slađan - assistant professor, dr Mašić Aleksandar - associate professor, dr Supić Dejan - assistant professor
Status: Subject from Elective Group 4, IV Semester
ECTS: 12
Prerequisite: None
The goal of the course: Introduction to basic principles of organizing biofarm (ecological or organic farm) as comprehensive, unified and efficient cycle of circulation and renewal of matter and way of establishing ecological balance.
The outcome of the subject: Completing planned program, students will dispose of significant findings connected with establishment, harmonization and functioning of plant and livestock production, through individual biofarm system and use of renewable energy, biomass management and producing high value products. Performing research study, students will gain practical skills in this area.
Syllabus: <i>Theoretical study</i> Principles of organic production at the farm level: use of various, environmental friendly, methods, techniques and technologies in the aim of yield increase. Plants and plant production. Soil fertility and biological activity. Organic and mineral fertilizers, green fertilizers and legumes, composting and mulch, microbiological preparations and other improvers and soil conditioners. Crops – soil covers; planting in the aim of weed, pest and disease control and soil quality improvement. Genetic variability: different varieties of local crops, use of local originate seeds, seeds exchange among local producers. Plant protection products – substances of plant and animal originate, microorganisms applicable at biological plant protection, trapped or scattered applied substances and other substances traditionally applied. Rational use of local water sources, adding organic matter to soil, use of mulch, water phytoremediation. Responsible use of energy and nature sources, maintenance of biodiversity and regional ecological balance. Eco corridors. Livestock production on the farm. General principles. Soil conversion and relation with livestock. Livestock conversion. Zoo techniques, transportation, identification of animal products, animal organic waste, free zones for animal moving and housing, keeping animals optimal density, protection of vegetation from overgrazing and general limits for animal housing. The basic preconditions for biofarm organizing: plan, infrastructure, crop rotation, documentation. General rules and basic postulates of biofarm organizing: relation between plant and livestock production, optimal animals number and diversity, minimum of (un)covered soil surface. The basic principles of biofarm functioning: individuality, self-sufficiency, restructuring, profitability, economic sustainable. Factors of systematic approach to business on the biofarm. Biofarm models. Multidisciplinary approach to biofarm organization. Specificity and qualitative traits of products obtained at the biofarm. <i>Practical classes</i> Biofarm modeling. Visit biofarms. Actively participate in defining the objectives of a biofarm and considering the difficulties and potential, through research.
Literature: Sredojevic, Z. (2002): Economical problems of ecological agriculture. Monography. University in Belgrade, Faculty of Agriculture Zemun. Lazic, B., Babovic, J. (2008): Organic agriculture, I i II. Field and Vegetable Institute Novi Sad. Miguel A. Altieri (2008): Small Farms as a Planetary Ecological Asset. ISBN: 978-983-2729-56-3 Urszula Malaga-Tobolaa, Sylwester Tabora, Sławomir Kocirab (2015): Productivity of resources and investments at selected ecological farms. Agriculture and Agricultural Science Procedia 7, 158 – 164. Low of organic agriculture

Sarkar P, Chourasia R (2017) Bioconversion of organic solid wastes into biofortified compost using a microbial consortium. Int J Recycl Org Waste Agric 6:321–334. <https://doi.org/10.1007/s40093-017-0180-8>
 Singh, D.P., Prabha, R., Renu, S. et al. Agrowaste bioconversion and microbial fortification have prospects for soil health, crop productivity, and eco-enterprising. Int J Recycl Org Waste Agricult 8, 457–472 (2019). <https://doi.org/10.1007/s40093-019-0243-0>
<https://educons.edu.rs/studenti/e-biblioteka/>

No. Active lectures: 9	Theoretical lectures: 4	Student research work: 5
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Teaching methods:
 Theoretical teaching part is performed in teaching rooms, using computer tools, by processed and presented lectures. Student research work is performed as field and laboratory trials, in accordance with area specify and at biofarms.

Score for grading (maximal 100 points)

Activity during the class - 10 points;
 Practical classes - 10 points;
 Colloquiums -20 points;
 Seminar papers - 20 points;
 Oral exam - 40 points.

Course Title: SIR3 (NIR3) DD1

Teacher(s): Mentor

Status: Obligatory, IV semester

ECTS:10

Prerequisite: None

The goal of the course:

The student is trained to implement statistical methods of data processing, interpretation, publication and presentation of results and independent preparation of a doctoral dissertation in the field of agricultural sciences.

The outcome of the subject:

The student is qualified for scientific research work, public publication and presentation of results and independent preparation of a doctoral dissertation.

Syllabus:

The student is engaged in scientific research in the field of agriculture, reviewing scientific and professional literature from the field in which it is working on its doctoral dissertation, applying statistical methods and models and processing data obtained during his dissertation and presenting them to the scientific public. If necessary, with the mentor, student makes a preliminary analysis of the obtained relations, trends and other results in the work and creates guidelines of importance for the preparation of the final work.

Literature:

Relevant national and international sources (monographs, books, scientific and professional papers) in the field to which the topic of the paper belongs.

No. Active lectures: 3	Theoretical lectures: 0	Student research work: 3
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Teaching methods:

Literature review, experimental work, processing of results, analysis of preliminary results from the doctoral dissertation, in consultation with the professor who directly manages the preparation of the doctoral dissertation.

Score for grading

Study research work is not evaluated numerically but only descriptive: mastered/did not master.

Course Title: SIR4 (NIR4) DD1		
Teacher(s): Mentor		
Status: Obligatory, V semester		
ECTS: 10		
Prerequisite: None		
The goal of the course: The student is trained to independently prepare a doctoral dissertation in the field of agricultural sciences, publishing and presenting the results.		
The outcome of the subject: The student is qualified for independent preparation of a doctoral dissertation, public announcement and presentation of results.		
Syllabus: Completion of experimental work. Systematization of results, statistical and graphic processing. Discussions with the mentor about the interpretation of the results and further updating of the literature. Work on training students for independent and public presentation of work.		
Literature: Relevant national and international sources (monographs, books, scientific and professional papers) in the field to which the topic of the paper belongs.		
No. Active lectures: 20	Theoretical lectures: 0	Student research work: 20
Teaching methods: Literature review, experimental work, processing of results, analysis of preliminary results from the doctoral dissertation, in consultation with the professor who directly manages the preparation of the doctoral dissertation. Use of appropriate computer programs.		
Score for grading Study research work is not evaluated numerically but only descriptive: mastered/did not master.		

Course Title: Publication of results - preparation of doctoral dissertation DD (DD2)			
Teacher(s): Mentors			
Status: Obligatory, V Semester			
ECTS: 20			
Prerequisite: Study research work and defined title of doctoral dissertation			
The goal of the course: The completion of the experimental work by mid-semester. Sorting results, their statistical and graphical processing. Writing material and methods which will be used for doctoral dissertations and papers, published three papers (two national and one international). Discussions related to the interpretation of results based on sorted data. Comparison of literature data with obtained results. Draft of independent work with all the elements that characterize the work in an international journal. Submission of the paper, with parallel writing of the introductory part, material and methods and results for the doctoral thesis.			
The outcome of the subject Enabling studies for independent placement of obtained results. Making tables, graphs or elements of the mechanisms of certain phenomena obtained during experiments. Competence for independent use of literature implies the development of analytical, systematic and identifying contemporary trends in the field of agricultural science and practice.			
Syllabus The content of the course is harmonized with the needs of a specific doctoral dissertation. The general content of the research before the preparation of the doctoral dissertation is: Research paper for topic selection and literature review (doctoral dissertation) - study research paper; Research work on setting up an experiment or experiment for the needs of a doctoral dissertation; Research work for data processing and analysis and research work on data design.			
Literature: Comparison and analysis of obtained results based on a large number of read references from the field covered by the doctoral dissertation.			
No. Active lectures: 0	Theoretical lectures: 0	Student research work: 0	Other classes: 10
Teaching methods: The student consults with the mentor and other professors, who are engaged in research and theory in the field of doctoral dissertation. Depending on the chosen topic for the doctoral dissertation, the student applies the adopted methods and procedures, acquired through compulsory and elective courses (measurements, examinations, statistical data processing, etc.).			
Score for grading Publication of results - development and defense of DD (DD2) is not evaluated numerically but only descriptive: mastered/did not master.			

Course Title: SIR5 (NIR5) DD1		
Teacher(s): Mentor		
Status: Obligatory, VI semester		
ECTS: 5		
Prerequisite: None		
The goal of the course: The student is trained to independently prepare a doctoral dissertation in the field of agricultural sciences, publishing and presenting the results.		
The outcome of the subject: The student is qualified for independent preparation of a doctoral dissertation, public announcement and presentation of results.		
Syllabus: Completion of experimental work. Systematization of results, statistical and graphic processing. Discussions with the mentor about the interpretation of the results and further updating of the literature. Work on training students for independent and public presentation of work.		
Literature: Relevant national and international sources (monographs, books, scientific and professional papers) in the field to which the topic of the paper belongs.		
No. Active lectures: 20	Theoretical lectures: 0	Student research work: 20
Teaching methods: Literature review, experimental work, processing of results, analysis of preliminary results from the doctoral dissertation, in consultation with the professor who directly manages the preparation of the doctoral dissertation. Use of appropriate computer programs.		
Score for grading Study research work is not evaluated numerically but only descriptive: mastered/did not master.		

Course Title: Doctoral dissertation defense (DD2)
Teacher(s): Mentor, members of the commission for evaluation and defense of the dissertation
Status: Obligatory, VI Semester
ECTS: 25
Prerequisite: Passed all exams, 150 ECTS points, published three papers (two national and one international from the SCI list2) approval of the commission for the evaluation of the doctoral thesis.
<p>The goal of the cours: Acquisition of theoretical and practical knowledge as well as skills on the manner, structure and form of writing scientific and professional papers, after conducting research within previous activities in the study program. Writing a dissertation is a creative work in which it is necessary to describe the issues, goal, manner and methods of research, as well as to analyze the obtained results and evaluate the expected scientific contribution and the possibility of applying the results in practice.</p>
<p>The outcome of the subject The doctoral dissertation is an original independent work of a candidate in a selected scientific field. Enabling students to write scientific and professional papers as the end product of a systematic approach to solving a specific problem. The acquired experiences in designing (writing) the dissertation are applied by doctoral students in practice when solving problems in a scientific field and indicate the facts why the dissertation contributes to the development of the selected scientific field in the study program. The student acquires the right to defend the doctoral thesis, after performing all the necessary research, independently processing all the literature and the results obtained and writing a doctoral dissertation. Enabling students to prepare and present the results of the doctoral dissertation for public defense. Students acquire the ability to independently present their own views and arguments, or critical thinking in response to questions and comments on a given topic.</p>
<p>Syllabus From the methodological point of view, the structure is defined by the applied methodology in the study of a given scientific field. The content of the course is formulated by the individual requirements of the research subject and the wishes and possibilities of the doctoral student. The student compiles a doctoral dissertation in accordance with the positive legal regulations in the field of higher education. The student prepares the defense of a written doctoral dissertation in agreement with the mentor and members of the Commission, and in accordance with the applicable rules and procedures. After obtaining the written consent of the mentor to the text of the dissertation, the dissertation must be processed within the procedure and program for checking plagiarism. When it is determined that the overlap of the text is not more than 20%, the candidate conducts technical processing of the text and binding of the dissertation. After conducting the appropriate procedure in accordance with the general acts of the faculty, the doctoral dissertation is suitable for public defense.</p>
<p>Literature: Internationally recognized journals (from the SCI list and / or the KoBSON list) Doctoral dissertations in the field.</p>

No. Active lectures: 0	Theoretical lectures: 0	Study research work: 0	Other classes: 10
<p>Teaching methods: The mentor of the doctoral dissertation during the preparation (writing) in contact classes (consultations) directs the student to certain literature and practice regarding the content and form of the doctoral dissertation. When writing a doctoral dissertation, the doctoral student uses relevant methods of scientific research, analysis, conclusion and presentation of research results. During the preparation for the public defense of the doctoral dissertation, the mentor conducts consultations with the candidate and gives appropriate instructions regarding the form and content of the presentation and presentation during the public defense. After presenting the results of the doctoral dissertation, the candidate orally answers the questions and remarks.</p>			
<p>Score for grading Doctoral dissertation defense (DD2) is not evaluated numerically but only descriptive: mastered/did not master.</p>			