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

**AGRICULTURAL SCIENCES**

# **S Y L L A B U S   B O O K**

Sremska Kamenica  
May, 2014

<b>Study program:</b> Agricultural Sciences	
<b>Type and level of study:</b> Doctoral academic studies	
<b>Course Title:</b> Biotechnology in Agriculture	
<b>Teacher(s):</b> Dr Pankovic M. Dejana, full professor and dr Dragan G. Perovic, associate professor	
<b>Status:</b> Obligatory, II semester	
<b>ECTS:</b> 11	
<b>Prerequisite:</b> None	
<b>The goal of the course:</b> The main objective of the course Biotechnology in Agriculture is acquiring knowledge on the application of modern biotechnological methods in agriculture. In addition to mastering basic knowledge of molecular biology, the goal is understanding current knowledge on the relationship between plants and their environment, and biotic and abiotic stresses, which are the most common cause of decrease in crop production. Students will learn about the biotechnological methods used in the creation of transgenic plants, as well as increasing the resistance of plants to disease by using non-GMO methods of biotechnology.	
<b>The outcome of the subject:</b> Enabling students for the practical application of modern biotechnological methods in agriculture and adoption of multidisciplinary approach to solving the fundamental problems in agriculture.	
<b>Syllabus:</b> <i>Theoretical part</i> - 1 Introduction to Biotechnology ( Definition and classification of biotechnology , plant biotechnology , basic concepts of genomes and genome manipulation ) ; 2 gene modification and gene manipulation ( analysis and nucleic acid amplification ; enzymes as tools , general concepts of PCR as a diagnostic method ) ; 3 Laboratory methods in analyzing the genome of plants 1 ( Extraction of DNA using the DNeasyPlantMiniKit ( Qiagen ) . Determination of the concentration of the extracted DNA by spectrophotometry - Nanoview spectrophotometer ) ; 4 Cultivation of genetically resistant plants against diseases ( diseases of plants , methods for controlling plant diseases , application of biotechnology to increase the resistance of plants to diseases ) ; 5 Case Study - Increasing resistance to downy mildew in sunflower (sunflower and sunflower downy disease genes for resistance to downy mildew, use of molecular markers in sunflower breeding for resistance to downy mildew, genetic map Pl6 loci ) 6 Laboratory methods in the analysis of the genome of the plants 2 ( PCR - identification of the genes for disease resistance ) ; 7 Laboratory methods in analyzing the genome of the plants 3 ( Digestion of the PCR product by restriction enzyme digestion and electrophoresis ) ; 8 Molecular Agriculture ( Metabolic Engineering ; Examples of metabolism manipulation, Biodegradable Plastics , Edible vaccines ; Bioreactors ) ; 9 Useful microorganisms in agriculture ( Trichoderma - Application for increasing the resistance of plants to biotic and abiotic stresses ) 10 Laboratory methods in the analysis of the genome of microorganisms from soil 1 ( Extraction of DNA from soil and in pure cultures , determination of the concentration of the extracted DNA by spectrophotometry - Nanoview spectrophotometer ) ; 11 Laboratory methods in the analysis of the genome of microorganisms in soil 2 ( PCR identification of Trichoderma strains by examining the variability of ITS sequences ) ; 12 Biotechnology and Environmental Protection (Environmental and health issues related to environmental protection , ethical and legal aspects of biotechnology ) ; <i>Practical classes</i> -	
<b>Literature:</b> Čurčić Nataša, Panković Dejana (2011) Gajenje genetički otpornih biljaka prema bolestima u cilju zaštite životne sredine. Monograph, 101 p., ISSN / ISBN978-86-87785-34-2, COBISSSR-ID267537671, University Educons, Print Atelje Sremska Kamenica. Ana Simonovic (2011) Biotehnologija i genetičko inženjerstvo biljaka, 401 p., NNK Internacional, Beograd Pavicevic Dušanka Savic, Gordana Matic (2011) Molekularna biologija 1,364 p. NNK Internacional, Beograd.	
<b>Number of lectures:</b>	Other Classes

Lectures: 10	Practices: 4	Other forms of teaching:	Student research work: 6	
<b>Teaching methods:</b>				
Score for grading (maximal 100 points)				
A way of assessment may be different (written exam, oral exam, project presentations, seminars, etc.				

<b>Study program:</b> Agricultural Sciences			
<b>Type and level of study:</b> Doctoral academic studies			
<b>Course Title:</b> Soil Quality Management in agriculture			
<b>Teacher(s):</b> Dr Jovica Vasin, Research Associate; dr Ljubinko Jovanovic, full professor			
<b>Status:</b> Elective 4, IV semester			
<b>ECTS:</b> 11			
<b>Prerequisite:</b> None			
<b>The goal of the course:</b> Introduction to the principles of long-term maintenance of soil quality in the various system production.			
<b>The outcome of the subject:</b> Completed the planned program, students will dispose of significant findings related to the establishment, maintenance of soil quality in relation to the type of crop plants. Through study research, will acquire practical skills in this area.			
<b>Syllabus:</b> <i>Theoretical study</i> – Soil as live dynamic system. The management of soil quality as a basis for improving the productivity and quality of soil and its characteristics necessary for growing plants. Parameters important for processed and adopted laws soil quality, organic matter, soil conservation structures, optimal use of bio pesticides and bio fertilizers, soil compaction (optimal water air regime). Biodiversity: the role of plant belts area, biobarriers to protect water from pollutants. Role of crop rotation to improve soil quality. The role of plant residues and soil coverage for long-term maintenance of soil fertility. Multiple roles of land in the environment. Land as a dynamic system. The role of the microorganisms and other beneficial organisms in the soil. Soil water regime. Indicators of soil quality (physical, chemical, biological). Cycles of nutrients in the soil matrix. Methods of revitalization land, bioremediation techniques. <i>Practical classes</i> - Active participation in defining indicators of soil quality, service area through practical handling and research.			
<b>Literature:</b> 1. Агроекологија: Снежана Ољача, 2010 2. Foreign and domestic literature (review papers, books and presentations from the Internet)			
<b>Number of lectures:10</b>			Other Classes
Lectures: 4	Practices:	Other forms of teaching:	
Student research work:7			
<b>Teaching methods:</b>			
Score for grading (maximal 100 points)			
<b>Pre-commitments</b>	<b>Poens</b>	<b>The final exam</b>	<b>Poens</b>
Activity during lectures	10	Written exam	20
Practical classes	40	Oral examination	20
Colloquia			
Seminars	10		

<i>Total</i>	60		40
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<b>Study program:</b> Agricultural Sciences			
<b>Type and level of study:</b> Doctoral academic studies			
<b>Course Title:</b> Marketing in rural areas			
<b>Teacher(s):</b> Prof. dr Svetlana Mihic			
<b>Status:</b> Elective 3, III semester			
<b>ECTS:</b> 15			
<b>Prerequisite:</b> None			
<b>The goal of the course:</b> Development of critical thinking, creative research skills and practical skills in the field of marketing strategy in agricultural production			
<b>The outcome of the subject:</b> Competence to independently solve theoretical and practical problems, organizing and conducting theoretical and applied research in the field of marketing strategy in agricultural production.			
<b>Syllabus:</b> <i>Theoretical study</i> - Theoretical methodological assumptions of strategic marketing in agricultural production. Scope and method of strategic marketing in agricultural production. Relationship to other research disciplines. Management and research of existing marketing strategies in agricultural production. Contemporary approaches to the study of marketing strategy. <i>Practical classes</i> - Design of research and its practical realization.			
<b>Literature:</b> Prof. dr Momčilo Milisavljević, <i>Strategijski marketing</i> , Ekonomski fakultet, Beograd, 2010. Božidarević, D. (2002). <i>Marketing poljoprivrednih i prehrambenih proizvoda</i> . Poljoprivredni fakultet. Sudarević, T. (2010). Ekonomski faktori i marketing aktivnosti u razvoju organske poljoprivredne proizvodnje u Srbiji i Stanje u ponudi organskih poljoprivrednih proizvoda u Srbiji.			
<b>Number of lectures:</b>			Other Classes
Lectures: 10	Practices: 3	Other forms of teaching: 7	
<b>Teaching methods:</b> Working in study groups, research design, implementation and presentation of research results and scientific professionals. Development of case studies.			
Score for grading (maximal 100 points)			
<b>Pre-commitments</b>	<b>Poens</b>	<b>The final exam</b>	<b>Poens</b>
Activity during lectures	20	Written exam	50
Practical classes	50	Oral examination	50
Colloquia	30		
Seminars			
<i>Total</i>	100		100

<b>Study program:</b> Agricultural Sciences
<b>Type and level of study:</b> Doctoral academic studies
<b>Course Title:</b> Genetic Resources in Agronomy and Breeding
<b>Teacher(s):</b> Dr Perovic G Dragan, associate professor and dr Pankovic M. Dejana full profesor
<b>Status:</b> Elective 3, IV Semester
<b>ECTS:</b> 11
<b>Prerequisite:</b> None
<b>The goal of the course:</b> The goal of course is to provide doctoral students advanced knowledge of a plant agro genetic resources, their conservation as well as the conventional and molecular methods and techniques for their utilization in breeding for conventional agriculture and organic production . The subject is an upgrade of an elective subject genetic resources in agronomy and breeding. The aim of this course is to provide students, who have acquired basic 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 .
<b>The outcome of the subject:</b> 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 farmers organic farming appropriate varieties and lines.
<b>Syllabus:</b> <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 further expand their knowledge of plant gene bank, their history and current trends in their work, as well as methods of conservation: Exsitu and Insitu conservation and on farm conservation. Since the subject is an upgrade of an elective subject agro genetic resources and their preservation, there is an emphasis on pre-breeding in and use of molecular markers in the target selection of varieties for conventional and organic production. Methods triage genotypes with desirable traits to 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 phenotypic evaluation of plant genetic collections and segregating populations, interactive classes with laboratorijske and field exercises, discussions with experts in certain topics and visits to scientific institutions engaged in breeding.
<b>Literature:</b> 1) Боројевић С 1981: Принципи и методе оплемењивања биља. Радивој Типранов , Нови Сад, 387 стр. 2) Пенчић, М. 2005: Биљни генетички ресурси: изабрани радови. Југословенска инжењерска академија. Београд.

3)Prodanović, S., Šurlan-Momirović, G. (2006): Genetički resursi biljaka za organsku poljoprivredu. Poljoprivredni fakultet, Beograd			
<b>Number of lectures:</b>			Other Classes
Lectures: 4	Practices:	Other forms of teaching:	
Student research work:7			
<b>Teaching methods:</b>			
Score for grading (maximal 100 points)			
<b>Pre-commitments</b>	<b>Poens</b>	<b>The final exam</b>	<b>Poens</b>
Activity during lectures	10	Written exam	20
Practical classes	40	Oral examination	20
Colloquia			
Seminars	10		
<i>Total</i>	60		40



Study program: Agricultural Sciences
The type and level of study: PhD program
Subject title: RESEARCH SKILLS (ДН-Б-01)
Teacher: Steve A. Quarrie
Status: Obligatory , I semester
ECTS: 10
Prerequisite: none
<b>The goal of the course:</b> The aim of the course is to provide post-graduate students with an appreciation of the qualities needed to develop a successful international research career. It will also equip them with a broad range of generic (lifelong learning) skills, valuable for any career in academia and commerce.
<b>The outcome of the subject:</b> To know how to look for the truth and to recognise when it has been found.To acquire skills to develop arguments and ideas and present them in a logical manner.To recognise what makes a well-designed research experiment.To appreciate different methods for processing and analysing experimental results.To be able to construct a good quality scientific paper for publication in English.To acquire and demonstrate skills in presenting scientific research to others at meetings.To acquire basic skills for self-management, management of others and project management.To know the criteria needed to write a successful research proposal.To appreciate the qualities needed for effective research student supervision and mentoring.
<b>Content:</b> The course has six main sections and is given in English - the language of international scientific communication. Throughout the course students will be challenged to think creatively, to be critical of others and themselves, and to develop their thoughts in a logical manner. The course has activities during lectures and homework between lectures. Good quality research: Looking for the truth, hypothesis testing, the research cycle, the research pyramid, a Gantt chart in practice, principles of experimental design, anticipating problems, the Null Hypothesis, sources of error, data quality control, errors in biochemical analyses, ignoring data but avoiding fraud. Scientific writing skills:Recognising whether you have good quality science, different types of research papers, suitable journals, impact factors, journal instructions for authors, "once upon a time ... they all lived happily ever after", how to tell a convincing story, recommendations for Introduction, Materials and Methods, Results, Discussion, the abstract, improving the style and the English, the refereeing process. Presentational skills: Points to consider for posters, identifying the pros and cons of different poster styles, how to put together a PowerPoint presentation, preparing what to show, preparing how to show it, preparing the environment, commenting on a short presentation. Writing research proposals: Examples of different types of proposal and the criteria to be met, the philosophy needed for success, detailed description of an EU Framework application, background/objectives, workplan/Gantt and PERT charts, milestones and deliverables, management, risk analysis, budget, Logical Framework Matrix, a "road map" on developing skills in proposal writing. essential points to remember. Management skills: Self-management, time management, setting priorities (importance and urgency), managing your lab, managing your research team, project management, chairing meetings, minutes of meetings, strategic planning, SWOT analysis, career development and CVs. Student supervision: The purpose of post-graduate research, example of a formalised research training programme, planning a research project, from novice technician to independent researcher, getting students constantly

questioning, research ethics, getting used to writing, help with the thesis, gaining generic/transferrable skills.

**Literature:** 1. Survival Skills for Scientists (2006) F. Rosej, T Johnston. Imperial College Press, ISBN 1-86094-641-0 (pbk); 2. Kathy Barker (2002) At the helm - a laboratory navigator. Cold Spring Harbor Laboratory Press; 3. Allan Jones, Rob Reed (2000) Practical skills in biology. Prentice Hall; 4. How to Write & Publish a Scientific Paper (1998) 5th Edition. RA Day, Oryx Press, ISBN 1-57356-165-7 (pbk) 5. How to Write and Illustrate a Scientific Paper (2003) B Gustavii, Cambridge University Press, ISBN 0-521-53024-5 6. How to Present at Meetings (2007) GM Hall, Blackwell Publishing, ISBN 1-4051-3985-4S McCarthy (2007) 7. How to write a competitive proposal for Framework 7.  
<http://www.aresearchguide.com>, <http://www.ibs.cam.ac.uk/librarv/research/presentation.html>

<b>Number of lectures:</b>			Other Classes
Lectures: 4	Practices:	Other forms of teaching:	

**Teaching methods:** Methods of teaching practice: The course will be given using a combination of lectures, group work, work in pairs, as well as private study.

Score for grading (maximal 100 points)

**Assessment of knowledge:**  
 Active participation in the preparation and execution of seminars throughout the course (70%). A written essay (30%).

<b>Study program:</b> Agricultural Sciences			
<b>Type and level of study:</b> Doctoral academic studies			
<b>Course Title:</b> Strategic management in Agribusiness			
<b>Teacher(s):</b> Full professor, Mašić Branislav, PhD; Associate professor Tot I. Vilmoš, Phd			
<b>Status:</b> Elective 4, IV semestar			
<b>ECTS:</b> 11			
<b>Prerequisite:</b> None			
<p><b>The goal of the course:</b> is that doctoral students with the application of scientific research instruments, concepts, methods and techniques develop competencies, knowledge and skills in the field of strategic management in agribusiness, to as top professionals, researchers, consultants and change agents were able to strategically create the future, change and lead organizational change, or in other words, to create and maintain a competitive advantage of the organization and its success in the new term in the field of agribusiness system. It is important to emphasize the security of an organization from the surprises that come out of her dynamic and global environment.</p>			
<p><b>The outcome of the subject:</b> Doctor of ecological agriculture, consultant, agent of change and scientific research worker, who will with their core knowledge, competencies and skills be able to proactively manage organizational change, creating and sustaining organizational competitive advantage in the long run in agribusiness organizations.</p>			
<p><b>Syllabus:</b>  <i>Theoretical study</i> - Dimensions of Strategic Management in Agribusiness (evolution of management systems and the emergence of strategic management, strategic and operational management, the key attributes of strategic management, corporate governance and stakeholder management, strategy and process of creating strategies and models of strategic management). Analysis of external and internal organizational environment. Directing the organization (strategic vision, mission and goals). Formulating strategies at different levels of the organization in agribusiness. The international strategy. Digital business strategy. The implementation of the strategy. Strategic control. Managing innovation and fostering corporate entrepreneurship. Corporate Culture and Leadership (knjučevi for strategy and strategic change). How to strategically manage in an era of speed, globalization and knowledge? New concepts and approaches to strategic management (learning organization, core competence, knowledge management, customer relationship management, methods and programs of radical changes in the organization). Balanced list of criteria in Agribusiness (Balanced Scorecard). Privatization and improving competitiveness in agribusiness. Strategy clusters in agribusiness companies.  <i>Practical classes</i> - Applied research in specific organizations in agribusiness using case studies.</p>			
<p><b>Literature</b></p> <ol style="list-style-type: none"> <li>1. Freddie L. Barnard, Jay T. Akridge, Frank J. Dooley, (2012): Agribusiness Management Fourth Edition, Routledge; 4 edition,</li> <li>2. Ronald Kay, William Edwards, Patricia Duffy, Farm Management, McGraw-Hill Science, 7 edition (2011)</li> <li>3. Erić, D. et al (2007) Strategic Management in Agribusiness, Institute of Economic Sciences, Belgrade</li> <li>4. Dess, G.G., Lumpkin, G.T., Eisner, A.B. (2007) Strategic management, <i>Data Status, Belgrade</i></li> <li>5. Thompson, A.A., Strickland, A.J., Gamble, J.E. (2005): <i>Crafting and Executing Strategy: Concepts and Cases</i>, McGraw-Hill, Irwin</li> <li>6. Hitt, M.A., Ireland, R.D., Hoskisson, R.E., (2005): <i>Strategic Management: Competitiveness and Globalization</i>, Thomson, South-Western</li> <li>7. Johnson, G., Scholes, K., Whittington, R. (2008): <i>Exploring Corporate Strategy: Texts and Cases</i>, Prentice Hall</li> <li>8. Milisavljević, M., (2012): Startegic management: analysis, choice, change; CID, Faculty of economics, Belgrade</li> <li>9. Mašić, B. (2009): Strategic management, University Singidunum, Belgrade</li> </ol>			
<b>Number of lectures: 10</b>			Other Classes
Lectures: 3	Practices:	Other forms of teaching:	
Student research work: 7			
<b>Teaching methods:</b> Lectures, exercises, case studie analysis, project work, presentations and consultations.			
Score for grading (maximal 100 points)			
<b>Pre-commitments</b>	<b>Poens</b>	<b>The final exam</b>	<b>Poens</b>
Activity during lectures		Written exam	

Practical classes		Oral examination	30
Case study analysis	<b>20</b>		
Project work	<b>50</b>		
<i>Total</i>	70		30

<b>Study program:</b> Agricultural Sciences				
<b>Type and level of study:</b> Doctoral academic studies				
<b>Course Title:</b> Stress factors in agriculture				
<b>Teacher(s):</b> professor Ljubinko Jovanovic, PhD; research asociate Filis Morina, PhD				
<b>Status:</b> Elective 1, II semester				
<b>ECTS:</b> 12				
<b>Prerequisite:</b> None				
<b>The goal of the course:</b> Acquiring knowledge about different adverse factors in agriculture (abiotic, biotic, anthropogenic) which may influence plant productivity and properties and quality of soil. Effects of these factors on processes in plants and soil. Means of overcoming the negative effects of these factors.				
<b>The outcome of the subject:</b> Understanding the effects of different stress factors in plants and soil and choosing right means for improving plant performance and soil conditions. Students will gain experience in organizing and performing experiments and data analysis. Ability to independently create experiments, suggest research topics and carry out research projects in this field. The course should enable students with knowledge and experience necessary to become involved in research in scientific institutes and faculties.				
<b>Syllabus:</b> <i>Theoretical study</i> - Definitions and classification of stress factors in agriculture. Detrimental effects in agriculture. Stress factors and plants. Plant-soil interactions. Effects of different abiotic factors (temperature, water, metal contamination, organic contaminants) on plants. Effects of these factors on metabolic status of plants, protective and adaptive mechanisms. Anthropogenic stress factors. Effects of water deprivation on soil and soil biota. Microorganisms and adverse soil conditions. Remediation of degraded soils. Strategies for overcoming stressful conditions in agro-ecosystems. <i>Practical classes</i> - Performing experiments in the field and under controlled conditions. Using different tools and equipment for analysis of soil and plants. Seminars and practical exercises with students on bachelor and master studies. Writing academic papers.				
<b>Literature:</b> Taiz L, Zeiger E. Plant Physiology fifth edition, University of California, USA Madhava Rao, K.V., Raghavendra. A.S., Janardhan Reddy, K. 2006. Physiology and Molecular Biology of Stress Tolerance in Plants. Springer, Netherlands. Waisel Y., Eshel A., Kafkafi U. (Eds.). 2002. Plant Roots: The Hidden Half. Marcel Dekker, New York. Rai, A.K., Takabe, T. 2006. Abiotic Stress Tolerance in Plants-Toward the Improvement of Global Environment and Food. Springer, Netherlands. Review articles and all related publications				
<b>Number of lectures:</b>				Other Classes
Lectures: 10	Practices: 4	Other forms of teaching:	Student research work: 6	

<b>Teaching methods:</b> Theoretical interactive classes, video and internet presentations, seminars, symposiums, field experiments			
Score for grading (maximal 100 points) Oral and written exams, project presentations, seminars			
<b>Pre-commitments</b>	<b>Poens</b>	<b>The final exam</b>	Poens
Activity during lectures	10	Written exam	20
Practical classes	30	Oral examination	20
Colloquia			
Seminars	20		
<i>Total</i>	60		40

<b>Studyprogram:</b> Agricultural Sciences			
<b>Type and level of study:</b> Doctoral academic studies			
<b>Course Title:</b> Biofarm – source of high value products			
<b>Teacher(s):</b> Pavlovic M. Milanko, assistant professor, Drazic M. Dragana, research fellow, Nikolic P. Olivera, assistant professor			
<b>Status:</b> Elective 3, IV semester			
<b>ECTS:</b> 11			
<b>Prerequisite:</b> None			
<b>The goal of the course:</b> 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.			
<b>The outcome of the subject:</b> 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.			
<b>Syllabus:</b> <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: mixed crops, strips crops, different varieties of the same crop, different varieties of local crops, use of local originate seeds, seeds exchange among local producers. Crop rotation. Weed, disease and pest control. 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 in aim to improve its water hold capacity, 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, documentations,... 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. Market, distribution and sale. International standards (The International Federation of Organic Agriculture Movements – IFOAM), national standards and regulations. <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.			
<b>Literature:</b> 1. Sredojevic, Z. (2002). Ekonomski problemi ekoloske poljoprivrede. Monografija. Poljoprivredni fakultet Zemun Univerzitet u Beogradu. 2. Lazic, B. & Babovic, J. (2008). Organska poljoprivreda, I i II. Institut za ratarstvo i povrtarstvo Novi Sad. 3. Zakon o organskoj poljoprivredi			
<b>Number of lectures:</b>			Other Classes
Lectures: 4	Practices:	Other forms of teaching:	
Student research work: 7			

**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)

<b>Pre-commitments</b>	<b>Poens</b>	<b>The final exam</b>	Poens
Activity during lectures	<b>10</b>	Written exam	
Practical classes	<b>10</b>	Oral examination	<b>40</b>
Colloquia	<b>2 x 10 = 20</b>		
Seminars	<b>20</b>		
<i>Total</i>	<b>60</b>		<b>40</b>



<b>Studyprogram:</b> Agricultural Sciences			
<b>Type and level of study:</b> Doctoral academic studies			
<b>Course Title:</b> Specificity of plant production			
<b>Teacher(s):</b> Pavlovic M. Milanko, assistant professor, Jovanovic B. Ljubinko, full professor, Nikolic P. Olivera, assistant professor			
<b>Status:</b> Obligatory, III semester			
<b>ECTS:</b> 12			
<b>Prerequisite:</b> None			
<b>The goal of the course:</b> Introduction to basic principles of different systems of plant production, from conventional over integral to organic and specificity of plant production technology in the aim to achieve agro - ecosystem sustainability.			
<b>The outcome of the subject:</b> Completing planned program, students will dispose of significant knowledge and abilities to select adequate agritechnique treatments, the way and time of their application in plant production, adapted to the requirements of plant species, agriclimate region characteristics, market demands and planting system characteristics.			
<b>Syllabus:</b> <i>Theoretical study –</i> Soil cultivation - importance, aim and way. Tillage and other cultivation procedures (time, depth, way). Soil cultivation system. Crop rotation - elements, reasons and pre – crop value. Grass plot system of cropping and system of free soil management. Plant production systems. Weeds and its control, definition and systematic. Seed - sowing and planting, seed traits, seed preparation, time, depth and way of sowing. Crop care – mechanical, physical and chemical care techniques. Water erosion and deflation – factors, agritechnique treatments against erosion and deflation. Soil fertility – diagnosis. Soil organic matter. Procedures for soil fertility improvement. Organic fertilizers. Harmonization organic matter mineralization with nutrients absorption. Procedures for preventing nutrients loss. <i>Practical classes –</i> Crop rotation planning. Knowing the most important weeds. Sowing and planting – sowing way, sowing rate, sowing quality rating.			
<b>Literature:</b> 1. Kovacevic, D. (2003). Opšte ratarstvo. Poljoprivredni fakultet Yemun Univerzitet u Beogradu. 2. Molnar, I., Milosev, D. & Kurjacki, I. (2003). Praktikum iz Opsteg ratarstva, II izdanje. Poljoprivredni fakultet Univerzitet u Novom Sadu. 3. Manojlovic, M. (2008). Djubrenje u održivoj poljoprivredi. Poljoprivredni fakultet Univerzitet u Novom Sadu.			
<b>Number of lectures:</b>			Other Classes
Lectures: 3	Practices:	Other forms of teaching:	Student research work: 7
<b>Teaching methods:</b> 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.			
Score for grading (maximal 100 points)			
<b>Pre-commitments</b>	<b>Poens</b>	<b>The final exam</b>	<b>Poens</b>
Activity during lectures	<b>10</b>	Written exam	
Practical classes	<b>10</b>	Oral examination	<b>50</b>
Colloquia	<b>2 x 10 = 20</b>		
Seminars	<b>10</b>		
<i>Total</i>	<b>50</b>		<b>50</b>

<b>Study program:</b> Agricultural Sciences			
<b>Type and level of study:</b> Doctoral academic studies			
<b>Course Title:</b> Chemical and organic hazards in animal feed			
<b>Teacher(s):</b> Zoran S Masic, PhD, full professor			
<b>Status:</b> Elective 1, II semester			
<b>ECTS:</b> 12			
<b>Prerequisite:</b> None			
<b>The goal of the course:</b> Learning about different residues and otherorganic and anorganic contaminants and harmful microorganisms that can be found in animal feed and influence food security and health safety of animal products.			
<b>The outcome of the subject:</b> Students will acquire necessary experience and knowledge about safety of animal feed and animal products in organic agriculture.			
<b>Syllabus:</b> <i>Theoretical study</i> - Introduction to food safety and different organic and anorganic contaminants and residues in animal feed, their metabolic pathways and impact on the quality and health safety of animal products. Introduction to national and international legislation regarding food safety. <i>Practical classes</i> - Learning about different methods and analysis for determination of health safety of animal feed and animal products			
<b>Literature:</b> International journals and articles regarding food poisoning and helath disturbances in animals caused by pesticides and heavy metals in the food chain,journals			
<b>Number of lectures:</b>			Other Classes
Lectures: 10	Practices: 4	Other forms of teaching:	
Student research work: 6			
<b>Teaching methods:</b> Interactive classes using audio-visual means, practical laboratory work, becoming familiar with up to date analytical procedures related to animal feed.			
Score for grading (maximal 100 points) Oral and written exams, project presentations, seminars			
<b>Pre-commitments</b>	<b>Poens</b>	<b>The final exam</b>	<b>Poens</b>
Activity during lectures	10	Written exam	20
Practical classes	30	Oral examination	20
Colloquia			
Seminars	20		
<i>Total</i>	60		40

<b>Study program:</b> Agricultural Sciences			
<b>Type and level of study:</b> Doctoral academic studies			
<b>Course Title:</b> Scientific research methodology			
<b>Teacher(s)</b> Professor Sonja Veljovic-Jovanovic, PhD, Research Fellow			
<b>Status:</b> Obligatory, I semester			
<b>ECTS:</b> 12			
<b>Prerequisite:</b> None			
<b>The goal of the course:</b> Introduction to different approaches and methods used in scientific research, implementation of acquired knowledge for designing and conducting doctoral dissertation.			
<b>The outcome of the subject:</b> Developing skills for designing, organizing and conducting research independently in specific scientific area. Writing academic papers.			
<b>Syllabus:</b> <i>Theoretical study</i> - Introduction to scientific research. Formulation and coordination of research with current trends and reference centres. Techniques and methods used in laboratory research. Methods for designing experiments and collecting sampling material, experimental protocols. Methods for interpretation of data and presentation of results. Using search engines for scientific articles and using literature data. Writing scientific articles. Analysis and reviewing of scientific articles. Presentation techniques. <i>Practical classes</i> - The aim of the practical classes is to gain detailed knowledge about methods used in research in laboratory and field conditions. Demonstration of physiological and biochemical techniques for sampling, measurement and sample analysis. Students will learn about practical aspects of laboratory work, most common pitfalls and means to overcome them.			
<b>Literature:</b> Scientific articles, reviews, related book chapters			
<b>Number of lectures:</b>			Other Classes
Lectures: 10	Practices: 4	Other forms of teaching:	
Student research work: 6			
<b>Teaching methods:</b> Interactive lectures, writing literature reviews, exam preparations. Individual tutorials regarding theoretical/practical classes.			
Score for grading (maximal 100 points)			
<b>Pre-commitments</b>	<b>Points</b>	<b>The final exam</b>	<b>Points</b>
Activity during lectures	max 15	Written exam	max 15
Practical classes	max 25	Oral examination	max 20
Colloquia	max 10	Tests	max 15
Seminars			
<i>Total</i>			

<b>Study program:</b> Agricultural Sciences			
<b>Type and level of study:</b> Doctoral academic studies			
<b>Course Title:</b> Biological control in plant production			
<b>Teacher(s):</b> associate research, Slobodan B. Krnjajić, PhD			
<b>Status:</b> Elective 2, III semester			
<b>ECTS:</b> 11			
<b>Prerequisite:</b> None			
<b>The goal of the course:</b> The aim is to provide the students an adequate theoretical and practical knowledge in the field of application of biological methods of pest control in organic crop production. In this way, there shall be students who will be able to directly apply the different methods of biological control in organic crop production in crop, fruit and vegetable production.			
<b>The outcome of the subject:</b> Participants will acquire a functional, applicable knowledge in the field of biological pest control in crop production, which will be able to apply both conventional as well as in organic farming.			
<b>Syllabus:</b> <i>Theoretical study</i> - Basic principles of classical, integrated and organic farming. Benefits and differences of organic farming. Basics of plant protection in organic production. The application of preventive measures in plant protection. The use of alternative methods of plant protection. Possibilities of application of natural products based on extracts and essential oils of plants. <i>Practical classes</i> - Application of the disease on the basis of insect viruses, bacteria and fungi in plant protection. The use of predators and parasitoids in crop protection			
<b>Literature:</b> Polina Pierce Organic Garden (original title: Encyclopedia of Organic Gardening by Polina Pirs) Publisher Imhotep, Banja Luka. Lazic B., Đurovka M., Miskovic A. (2003): Principles of Organic Agriculture in vegetable production. Agricultural Engineering, Vol. 29, No. 1-2, p. 1-68.			
<b>Number of lectures:</b>			Other Classes
Lectures: 10	Practices: 3	Other forms of teaching: 7	
<b>Teaching methods:</b> Working in study groups, research design, implementation and presentation of research results and scientific papers. Development of case studies.			
Score for grading (maximal 100 points)			
<b>Pre-commitments</b>	<b>Poens</b>	<b>The final exam</b>	<b>Poens</b>
Activity during lectures	10	Written exam	20
Practical classes	40	Oral examination	20
Colloquia			
Seminars	10		
<i>Total</i>	60		40

<b>Study program: Agricultural Sciences</b>				
<b>Type and level of study:</b> Doctoral academic studies				
<b>Course Title:</b> Doctoral Thesis (Theoretical basis)				
<b>Teacher(s):</b> Mentor				
<b>Status:</b> Obligatory, Semester II				
<b>ECTS:</b> 15				
<b>Prerequisite:</b> None				
<b>The goal of the course</b> Students should, together with the mentor, define the approximate area that will be explored. Identifying research topics and possible resolutions using previously acquired knowledge, introduction with the relevant scientific literature. Introduction to the techniques that may be useful for future experiments in the field of agricultural sciences.				
<b>The outcome of the subject</b> Enabling students to independently identify and formulate the problem in the subject area of doctoral study analysis and critical approach to the use of previously acquired and new knowledge in the literature, which will result in the development of the broad themes of research.				
<b>Syllabus</b> - A preliminary agreement on the topic and content of the doctoral dissertation - Making a few minor coursework and small experimental projects as an introduction to related research for a doctoral dissertation - Consultation with the supervisor about possible problems in the preparation and development of a doctoral dissertation - Agreement on the potentially possible scientific research that will be included in the dissertation - Drawing attention to potential problems in proving hypotheses and choice of research methods Carrying out the necessary administrative steps to start working on student`s doctoral dissertation .				
<b>Literature</b> • Scientific research literature • Previously defended doctoral dissertations in the given field				
<b>Number of lectures:</b>				Other Classes
Lectures: 0	Practices:	Other forms of teaching:	Student research work:	
<b>Teaching methods:</b> With an aim for introducing the student to scientific research, mentor can suggest a seminar work to be presented at the conference. During the development of suggested topic for a doctoral dissertation, during the consultations, mentor directs the student to relevant literature.				
<b>Score for grading (maximal 100 points)</b> Defining the topic and choosing the methods for experimental work-50 points Candidate`s presentation of topic and method-50 points.				

<b>Study program: Agricultural Sciences</b>			
<b>Type and level of study:</b> Doctoral academic studies			
<b>Course Title:</b> Research work (preparing thesis application and start research)			
<b>Teacher(s):</b> Mentor			
<b>Status:</b> Obligatory, Semester III			
<b>ECTS:</b> 15			
<b>Prerequisite:</b> Doctoral Thesis (Theoretical basis)			
<b>The goal of the course</b> The aim is that during the third semester, doctoral student prepare a doctoral dissertation proposal, with all the necessary elements that a doctoral dissertation must contain. Preparation of a draft dissertation is the result of consultation with the supervisor and is a detailed program of scientific research, which will be included as part of a doctoral dissertation. <b>Starting of experiments.</b>			
<b>The outcome of the subject</b> Student independently prepares a proposal and begins experimental work.			
<b>Syllabus</b> - Consultation with the supervisor about the final topic of doctoral dissertation - Definition of hypotheses, by defining a method to be used in the experiments - Agreement on scientific research that will be included in the doctoral dissertation - Perform all the necessary preparatory actions for administrative application of the doctoral thesis			
<b>Literature</b> • Scientific research literature • Literature with the detailed and methodical procedures that will be used in the experiments • Previously defended doctoral dissertations in the given field			
<b>Number of lectures:</b>			Other Classes
Lectures: 0	Practices:	Other forms of teaching:	
Student research work:			
<b>Teaching methods:</b> Consultation, individual and group work, discussions, simulations			
<b>Score for grading (maximal 100 points)</b> Topic suggestion is 50 points, as well as the realization of experiments Proposed method that will be used in experiments is 20 points Practical work with instruments is 30 points			

<b>Study program: Agricultural Sciences</b>			
<b>Type and level of study:</b> Doctoral academic studies			
<b>Course Title:</b> Doctoral dissertation -study research			
<b>Teacher(s):</b> Mentor			
<b>Status:</b> Obligatory, Semester V			
<b>ECTS:</b> 30			
<b>Prerequisite:</b> Research work (preparing thesis application and start research)			
<b>The goal of the course</b> The completion of the experimental work by mid-semester. Putting together the results, statistical and graphical processing. Writing materials and methods to be used for a doctorate. Writing a paper for the symposium. Discussions with the supervisor about the interpretation of results based on the collated data. Comparison of literature data with our own results. Draft of independent work with all the elements that characterize the work of the international journal research paper.			
<b>The outcome of the subject</b> Enabling students to placeman the results independently. Creating tables, graphics or elements mechanisms of certain phenomena obtained during the experiments. Ability to independently use literature developing analytical, systematic and identifying current trends in the field of agricultural science and practice.			
<b>Syllabus</b> Course content is aligned with the needs of developing specific doctoral dissertation. Draft summaries of research in doctoral dissertation: - Research for the selection of topic and review of the literature (doctoral dissertation) (Research work 1) - Research work on setting up the experiment, reflecting the needs for doctoral dissertation (Research work 2) - Research for the processing and analysis of data and research on the design of the data (Research work 3)			
<b>Literature</b> Comparison and analysis of the results based on a large number of references in the field that deals with the doctor thesis.			
<b>Number of lectures:</b>			Other Classes
Lectures:	Practices:	Other forms of teaching:	
			Student research work: 30
<b>Teaching methods:</b> Student consults with the supervisor and other teachers who are engaged in research and theory in the field of doctoral dissertation. Depending on the chosen topic for a doctoral dissertation, the student applies the approved methods and procedures, acquired through obligatory and elective subjects (measurement, testing, statistical analysis, etc.).			
<b>Score for grading (maximal 100 points)</b> Pre-commitments-50 points The final exam-50 points			

<b>Study program: Agricultural Sciences</b>				
<b>Type and level of study:</b> Doctoral academic studies				
<b>Course Title:</b> Doctoral dissertation -study research				
<b>Teacher(s):</b> Mentor				
<b>Status:</b> Obligatory, Semester VI				
<b>ECTS:</b> 10				
<b>Prerequisite:</b> Doctoral dissertation -study research				
<b>The goal of the course</b> The completion of the experimental work by mid- semester. Putting together the results, statistical and graphical processing. Writing a manuscript for international journals (SCI list) Writing materials and methods to be used for a doctorate and manuscripts. Writing two independent manuscripts for international journal. Discussions of the interpretation of results based on the collated data. Comparison of literature data with the results. Draft of independent manuscript with all the elements that characterize paper in international journals. Submission of work (best by semester V). Parallely is written introduction, materials and methods and results of a doctoral thesis.				
<b>The outcome of the subject</b> Enable students to place the results independently. Development of tables, graphics or elements mechanisms of certain phenomena obtained during the experiments. Ability to independently use literature, developing analytical, systematic and identify current trends in the field of agricultural science and practice.				
<b>Syllabus</b> Course content is aligned with the needs of developing specific doctoral dissertation. Draft summaries of research in doctoral dissertation: - Research for the selection of topic and review of the literature (doctoral disseertation) (Research work 1) - Research work on setting up the experiment, reflected by needs of doctoral dissertation (Research work 2) - Research for the processing and analysis of data and research on the design of the data (Research work 3)				
<b>Literature</b> Comparison and analysis of their own results based on a large number of read references in the field that deals with the doctor thesis.				
<b>Number of lectures:</b>				Other Classes
Lectures:	Practices:	Other forms of teaching:	Student research work: 10	
<b>Teaching methods:</b> Student consults with the supervisor and other teachers who are engaged in research and theory in the field of doctoral dissertation. Depending on the chosen topic for a doctoral dissertation, the student applies the approved methods and procedures, acquired through obligatory and elective subjects (measurement, testing, statistical analysis, etc.).				
<b>Score for grading (maximal 100 points)</b> Pre-commitments-50 points The final exam-50 points				



<b>Study program: Agricultural Sciences</b>				
<b>Type and level of study:</b> Doctoral academic studies				
<b>Course Title:</b> Writing of doctoral dissertation				
<b>Teacher(s):</b> Mentor, members of an evaluation committee for dissertation				
<b>Status:</b> Obligatory, VI semester				
<b>ECTS:</b> 10				
<b>Prerequisite:</b> None				
<b>The goal of the course</b> The acquisition of theoretical and practical knowledge, as well as skills about the way, the structure and form of writing scientific papers after conducted research or within the past activities of the study program. Writing a dissertation is a creative work which is necessary to describe the issue, objectives, method and research, and also analyze the results and evaluate the expected scientific contribution and the possibility of applying the results in practice.				
<b>The outcome of the subject</b> The doctoral dissertation is the original independent work of candidates in selected scientific areas. Enabling students to write scientific papers as well as the end product of a systematic approach to solving a particular problem. Lessons learned in designing (writing) PhD students apply in practice in solving problems in the scientific field and point to the fact why dissertation contributes to the development of selected scientific field to study program.				
<b>Syllabus</b> On the methodological side, the structure is defined by the methodology applied in the study in given scientific field. Syllabus is formulated by individual requirements of the case study and by doctoral student needs and capabilities. Student prepares a doctoral thesis in accordance with the positive legal regulations in the field of higher education.				
<b>Literature</b> • Internationally recognized journals (SCI lists and / or Kobson list) • PhD thesis in the given field				
<b>Number of lectures:</b>				Other Classes
Lectures: 0	Practices:	Other forms of teaching:	Student research work:	
<b>Teaching methods:</b> During development (writing) of the dissertation, mentor during consultations directs students to specific literature and practical regarding of the content and form of a doctoral dissertation. PhD student in writing a doctoral dissertation using relevant methods of scientific research, analysis, reasoning and presentation of research results.				
<b>Score for grading (maximal 100 points)</b> Development of doctoral dissertation-100 points				

<b>Study program: Agricultural Sciences</b>				
<b>Type and level of study:</b> Doctoral academic studies				
<b>Course Title:</b> Defense of doctoral thesis				
<b>Teacher(s):</b> Mentor and committee members for the defense				
<b>Status:</b> Obligatory, VI semester				
<b>ECTS:</b> 10				
<b>Prerequisite:</b> All exams passed Approval of the commission for finished doctoral thesis				
<b>The goal of the course</b> Student has the right to approach the defense of doctoral thesis, after finishing all the necessary research, self-addressed all the literature material and the results and wrote his doctoral dissertation. Preparing students for the preparation and presentation of the results of the doctoral dissertation for the public defense. Students gain the ability to independently express views and arguments, and critical thinking in the answers to the questions and comments regarding a given topic.				
<b>The outcome of the subject</b>				
<b>Syllabus</b> Student prepares a written defense of the doctoral dissertation in consultation with the supervisor, in accordance with the applicable rules and procedures. After the implementation of appropriate procedures in accordance with the general regulations of the Faculty, doctoral dissertation is eligible for public defense.				
<b>Literature</b> • National journals of national importance and international journals • PhD thesis in the given field				
<b>Number of lectures:</b>				Other Classes
Lectures:	Practices:	Other forms of teaching:	Student research work:	
<b>Teaching methods:</b> In the course of preparing for a public defense of the doctoral dissertation, mentor conducts consultations with the candidate and gives appropriate instructions regarding the form and content of the presentations and the presentation during the public defense. After the presentation of the results of a doctoral dissertation, the candidate verbally responds to questions and objections addressed.				
<b>Score for grading (maximal 100 points)</b> The defense of the doctoral dissertation-100 points				