

Josip Juraj Strossmayer University of Osijek  
FACULTY OF AGROBIOTECHNICAL SCIENCES OSIJEK

# **CURRICULUM**

Plant production

(University Graduate Study Programme)

Major in **PLANT PRODUCTION**

Academic Year 2022-23

June, 2022

# List of Teachers and Courses

Academic year 2022 - 23

Plant production

(University Graduate Study Programme)

Major in **PLANT PRODUCTION**

A full-time Study Programme

I. semester								
COORDINATOR	COURSE NAME	TEACHERS ON THE COURSE AND TYPE OF CLASSES						ECTS
		NAME AND SURNAME	LECTURES	SEMINARS	EXERCISES			
					FE	AE	LE	
Dražen Horvat	Biometrics	Dražen Horvat Andrijana Rebekić Sanja Grubišić Šestanj	45				15 15	6
Danijel Jug	Agricultural Engineering and Plant Production Systems	Danijel Jug Bojan Stipešević Zdenko Lončarić Miro Stošić	30 5 12 17			3	6	2
Monika Marković	Irrigation of arable crops	Monika Marković	45			5	25	
Gordana Bukvić	Forage crops	Gordana Bukvić Ranko Gantner Goran Herman	30 25	5 5		5	5	5
Manda Antunović	Industrial crops	Manda Antunović	50	15		5		5
II. semester								
COORDINATOR	COURSE NAME	TEACHERS ON THE COURSE AND TYPE OF CLASSES						ECTS
		NAME AND SURNAME	LECTURES	SEMINARS	EXERCISES			
					FE	AE	LE	
Mirta Rastija	Cereals	Mirta Rastija Dario Iljkić	55 10	10				6
Sonja Vila	Arable crops breeding	Sonja Vila Sunčica Kujundžić	15 20	30	10			6
Vlado Guberac	Seed production of cereal crops	Vlado Guberac Vedran Orkić	30	45				6
Tomislav Vinković	Production patterns of vegetables and flowers	Tomislav Vinković Vlado Guberac Zdenko Lončarić Boris Ravnjak Monika Tkalec Kojić	15 5 10 0 15	5		5	15	5



Plant production (University Graduate Study Programme)  
Major in **PLANT PRODUCTION**

<b>BIOMETRICS</b>		
<b>Coordinator</b>	Dražen Horvat	
<b>Collaborators</b>	Sanja Grubišić Šestanj	
<b>Study year and semester</b>	First year, I. semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L+E+S)	75 (45 L + 30 E)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	To present and interpret the basics of scientific theory and scientific conclusion to graduate students through the application of statistical methods and tests.	
<b>Course enrolment requirements</b>	No enrolment requirements	
<b>Intended course learning outcomes</b>		
After successfully completing the course, the student will be able to:		
<ol style="list-style-type: none"> <li>1. Recognize basic statistical terminology.</li> <li>2. Identify adequate experimental methods and techniques.</li> <li>3. Set the research aims and scientific hypothesis. Organize and monitor the experiment, collect the experimental data, determine the sample size, edit the statistical series and group the data.</li> <li>4. Calculate basic statistical parameters using descriptive statistical methods: measures of central tendency, measures of variation.</li> <li>5. Properly apply parametric tests, analysis of variance, correlation-regression analysis, test time series.</li> <li>6. Recognize and apply numerous diagrams as visual tools for presentations of experimental data.</li> <li>7. Properly select and apply statistical non-parametric methods and analysis.</li> <li>8. Recognize basics of software for statistical data analysis (Statistica, SAS).</li> <li>9. Develop statistical (scientific) rethinking based on the results obtained by statistical analysis.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
The right to take the final exam is obtained by accumulating a minimum number of assessment points. Assessment points are earned based on class attendance (at least 70%), class activities, and grades from partial exams. During the semester, students take two partial exams (in the 7th and 15th weeks of classes). The final exam is mandatory, and a passing grade on the final exam is a prerequisite for a passing overall grade. The final exam is oral.		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Horvat, D., Ivezić, M. (2005): Biometrika u poljoprivredi. Poljoprivredni fakultet u Osijeku.</li> <li>2. Vasilj, Đ. (2000): Biometrika i eksperimentiranje u bilinogojstvu. Hrvatsko agronomsko društvo. Zagreb</li> </ol>		
<b>Additional literature</b>		
<ol style="list-style-type: none"> <li>1. Petz, B. (1985): Osnovne statističke metode za nematematičare. SNL, Zagreb.</li> <li>2. Hadživuković, S. (1991): Statistički metodi s primenom u poljoprivrednim i biološkim istraživanjima. Poljoprivredni fakultet, Novi Sad</li> <li>3. Mead, R., Curnow, R. N. and Hasted, A. M. (1993): Statistical Methods in Agriculture and Experimental Biology. Chapman &amp; Hall.</li> </ol>		

Plant production (University Graduate Study Programme)  
Major in **PLANT PRODUCTION**

<b>AGRICULTURAL ENGINEERING AND PLANT PRODUCTION SYSTEMS</b>		
<b>Coordinator</b>	Danijel Jug	
<b>Collaborators</b>	Bojan Stipešević Zdenko Lončarić Miro Stošić	
<b>Study year and semester</b>	First year, I. semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L + E + S)	75 (64 L + 11 E)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	Familiarize the participant with the content that represents selected chapters from the module Basics of Plant Production in the undergraduate study, specifically: soil tillage, fertilization, systems of land use, systems of plant production – crop rotation, free cropping, mono-cropping, intercropping.	
<b>Course enrolment requirements</b>	No enrolment requirements	
<b>Intended course learning outcomes</b>		
<p>After the course has been successfully completed, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Define, recognize, and assess the importance of individual soil tillage systems and propose, based on prior knowledge, measures for soil improvement and management.</li> <li>2. Compare and analyze soil tillage systems in Croatia, Europe, and the world.</li> <li>3. Identify specific measures and interventions related to fertilization, and understand and analyze the importance of soil conditioning.</li> <li>4. Recognize and understand the importance and significance of selecting and applying quality seed and planting material in plant production.</li> <li>5. Explain the importance of regulations regarding the trade of seed and planting materials.</li> <li>6. Plan, organize, and implement the sequence of individual agronomic interventions, primarily soil tillage systems, and select the most favorable plant production system based on the analysis and comparison of each individual system.</li> <li>7. Calculate and plan the necessary fertilization and the amount of seed for planting.</li> <li>8. Analyze existing systems and propose possibilities for adaptation to more modern agronomic systems.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
<p>The right to take the final exam is achieved by collecting a minimum number of assessment points. Assessment points are achieved on the basis of attendance (minimum 70%), activities in classes and grades from partial exams. During the semester, students take five partial exams (in weeks 3, 6, 9, 12 and 15 of classes). The final exam is mandatory, and a passing grade on the final exam is a prerequisite for achieving a passing overall grade. The final exam is oral.</p>		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Jug I., Jug D., Brozović B., Vukadinović V., Đurđević B. (2022): Osnove tloznanstva i biljne proizvodnje. Sveučilište Josipa Jurja Strossmayera u Osijeku, Fakultet agrobiotehničkih znanosti Osijek (FAZOS), Osijek, Hrvatska, ISBN: 978-953-8421-00-6.</li> <li>2. Jug D., Birkás M., Kisić I. (2015): Obrada tla u agroekološkim okvirima. Hrvatsko društvo za proučavanje obrade tala (HDPOT), Osijek, Hrvatska, ISBN: 978-953-7871-48-2.</li> <li>3. Jug D., Jug I., Vukadinović V., Đurđević B., Stipešević B., Brozović B. (2017): Konzervacijska obrada tla kao mjera ublažavanja klimatskih promjena. Hrvatsko društvo za proučavanje obrade tala (HDPOT), Osijek, Hrvatska, ISBN: 978-953-7871-61-1.</li> </ol>		
<b>Additional literature</b>		
<ol style="list-style-type: none"> <li>1. Bašić, F., Herceg, N. (2010): Temelji uzgoja bilja. Synopsis, Zagreb.</li> <li>2. Birkás, M. (2008): Environmentally–sound adaptable tillage. Akadémiai Kiadó, Budapest.</li> </ol>		

<b>IRRIGATION OF ARABLE CROPS</b>		
<b>Coordinator</b>	Monika Marković	
<b>Collaborators</b>		
<b>Study year and semester</b>	First year, I. semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L + E + S)	75 (45 L + 30 E)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	Familiarize students with the need for irrigation of cultivated crops, the methods and techniques of irrigation, the quality of water for irrigation, the elements of water dosage, and the specificities of irrigation by groups of crops.	
<b>Course enrolment requirements</b>	No enrolment requirements	
<b>Intended course learning outcomes</b>		
<p>After the course has been successfully completed, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Explain the issues related to the unregulated water-air regime in agricultural soils.</li> <li>2. Understand the problem of water deficiency in the soil as a consequence of drought.</li> <li>3. Choose appropriate methods of irrigation.</li> <li>4. Determine the elements of irrigation and familiarize with irrigation machinery.</li> <li>5. Define the source and quality of water for irrigation.</li> <li>6. Recognize the specificity of irrigation by crop types.</li> <li>7. State the maintenance of irrigation systems.</li> <li>8. Recommend irrigation based on groups of crops.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
<p>The right to take the final exam is achieved by collecting a minimum number of assessment points. Assessment points are achieved on the basis of attendance (minimum 70%), activities in classes and grades from partial exams. During the semester, students take two partial exams. The final exam is mandatory, and a passing grade on the final exam is a prerequisite for achieving a passing overall grade. The final exam is oral.</p>		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Šimunić, I. (2013): Uređenje voda. Hrvatska sveučilišna naklada. Zagreb.</li> <li>2. Madjar, S., Šošarić, J. (2009): Navodnjavanje poljoprivrednih kultura. Sveučilište Josipa Jurja Strossmayera. Poljoprivredni fakultet Osijek. Osječko-baranjska županija.</li> <li>3. Kos, Z. (1991): Hidrotehničke melioracije tla – kvaliteta vode za navodnjavanje. Školska knjiga. Zagreb.</li> <li>4. Kos, Z. (1989): Hidrotehničke melioracije tla – odvodnja i navodnjavanje. Školska knjiga. Zagreb.</li> <li>5. Tomić, F. (1988): Navodnjavanje. Fakultet poljoprivrednih znanosti. Zagreb.</li> <li>6. Mađar, S. (1986): Odvodnja i navodnjavanje u poljoprivredi. Zadrugar, Sarajevo.</li> </ol>		
<b>Additional literature</b>		
<ol style="list-style-type: none"> <li>1. Micheal, A.M. (1990): Irrigation Theory and Practice. Vikas publishing house PVT LTD New Delhi</li> <li>2. Kos, Z. (1991): Kvaliteta vode za navodnjavanje. Školska knjiga. Zagreb.</li> <li>3. Lešić, R., Borošić, J., Butorac, I., Čustić, M., Poljak, M., Romić, D. (2002): Povrcarstvo. Zrinski.</li> </ol>		

<b>FORAGE CROPS</b>		
<b>Coordinator</b>	Gordana Bukvić	
<b>Collaborators</b>	Ranko Gantner Goran Herman	
<b>Study year and semester</b>	First year, I. semester	
<b>Number of credits and mode of delivery</b>	ECTS	6
	Number of hours (L + E + S)	75 (55L + 15E + 5S)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	Familiarize students with the classification, morphological characteristics, agroecological conditions of cultivation, methods of use, and agrotechnical measures in the production of plant species that can be used as fodder in the feeding of domestic animals.	
<b>Course enrolment requirements</b>	No enrolment requirements	
<b>Intended course learning outcomes</b>		
After the course has been successfully completed, the student will be able to:		
<ol style="list-style-type: none"> <li>1. Evaluate the significance and possibilities of fodder production under the agroecological conditions of the Republic of Croatia.</li> <li>2. Select an appropriate cereal and/or mixture of cereals and annual legumes for feeding domestic animals in accordance with the needs of animal husbandry and the environmental conditions of cultivation.</li> <li>3. Plan the cultivation of various coarse-grain legumes under optimal and stressful growing conditions (acidic soils, water deficit, etc.).</li> <li>4. Predict losses in yield and quality of perennial forage legumes under different cultivation conditions, methods of use, and preservation, and devise strategies to reduce these losses.</li> <li>5. Establish the possibility of producing, utilizing, and storing root fodder crops.</li> <li>6. Develop a method for establishing grasslands depending on agroecological conditions of cultivation, methods of use, and the biological properties of the components of grass and/or clover-grass mixtures.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
The right to take the final exam is achieved by collecting a minimum number of assessment points. Assessment points are achieved on the basis of attendance (minimum 70%), activities in classes and grades from partial exams. During the semester, students take two partial exams. The final exam is mandatory, and a passing grade on the final exam is a prerequisite for achieving a passing overall grade. The final exam is oral.		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Stjepanović, M., Steiner, Z., Domaćinović, M., Bukvić, G. (2002): Konzerviranje krme. Agroekološko društvo u Osijeku. Osijek, Hrvatska.</li> <li>2. Stjepanović, M., Štafa, Z., Bukvić, G. (2008): Trave za proizvodnju krme i sjemena. Sveučilišni udžbenik. Hrvatska mljekarska udruga. Zagreb, Hrvatska.</li> <li>3. Gantner, R., Bukvić, G., Steiner, Z. (2021): Proizvodnja krmnog bilja. Sveučilište Josipa Jurja Strossmayera u Osijeku. Fakultet agrrobiotehničkih znanosti Osijek.</li> </ol>		
<b>Additional literature</b>		
<ol style="list-style-type: none"> <li>1. Antov, G., Čobić, T., &amp; Antov, A. (2004). Siliranje i silaže. Univerzitet u Novom Sadu. Poljoprivredni fakultet.</li> <li>2. Erić, P., Čupina, B., Mihailović, V., Gatarić, Đ. (2004): Krmno okopavine. Monografija, Institut za ratarstvo i povrtlarstvo, Novi Sad.</li> <li>3. Erić, P., Čupina, B., Mihailović, V., Mikić, A. (2007): Jednogodišnje krmne mahunarrke. Monografija, Institut za ratarstvo i povrtlarstvo, Novi Sad.</li> <li>4. Barnes, R. F., Nelson, J. C., Moore, K. J., Collins, M. (2007): Forages – the science of grassland agriculture (vol.2). Blackwell Publishing Professional. Ames, Iowa, USA.</li> <li>5. Stjepanović, M., Zimmer, R., Tucak, M., Bukvić, G., Popović, S., Štafa, Z. (2009). Lucerna. Sveučilište Josipa Jurja Strossmayera u Osijeku. Poljoprivredni fakultet u Osijeku.</li> <li>6. Stjepanović, M., Čupić, T., Gantner, R. (2012): Grašak. Sveučilište Josipa Jurja Strossmayera u Osijeku. Poljoprivredni fakultet u Osijeku.</li> </ol>		



<b>INDUSTRIAL CROPS</b>		
<b>Coordinator</b>	Manda Antunović	
<b>Collaborators</b>	Ivana Varga	
<b>Study year and semester</b>	First year, I. semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L + E + S)	75 (50 L + 10 E + 15 S)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	Acquaintance of students with the purpose of cultivation and agrotechnics of production of the most important plant species of industrial plants in the Republic of Croatia (sugar beet, sunflower, soybean, oilseed rape, tobacco, flax, industrial hemp, hops and potatoes).	
<b>Course enrolment requirements</b>	No enrolment requirements	
<b>Intended course learning outcomes</b>		
After the course has been successfully completed, the student will be able to:		
<ol style="list-style-type: none"> <li>1. Describe the origin, morphological structure, significance and definition of production objectives and everyday use of industrial plant products in human consumption, animal nutrition, pharmaceutical industry and more recently for energy generation.</li> <li>2. Analyze the yields in the Republic of Croatia and compare them with the results in Europe and the world.</li> <li>3. Describe and explain the impact of weather and soil quality on yield and yield quality of industrial plants.</li> <li>4. Describe the production technology of all industrial crops, the method of harvesting, and describe the conditions and method of handing over the crop to the buyer.</li> <li>5. Indicate the legal regulations (if present in a particular crop) of crop cultivation and sale.</li> <li>6. Analyze available information with the aim of finding useful information related to production on relevant websites (Ministry of Agriculture, Official Gazette...)</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
The right to take the final exam is achieved by collecting a minimum number of assessment points. Assessment points are achieved on the basis of attendance (minimum 70%), activities in classes and grades from partial exams. During the semester, students take two partial exams and submit a seminar paper. The final exam is mandatory, and a passing grade on the final exam is a prerequisite for achieving a passing overall grade. The final exam is oral.		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Butorac, J. (2009): Predivo bilje. Kugler, Zagreb.</li> <li>2. Pospíšil, A. (2010.): Ratarstvo - I dio. Zrinski d.d., Čakovec.</li> <li>3. Pospíšil, M. (2013): Ratarstvo II dio - industrijsko bilje, Zrinski d.d., Čakovec.</li> <li>4. The latest papers published in the international reference papers will be determined during the course of the lecture.</li> </ol>		
<b>Additional literature</b>		
<ol style="list-style-type: none"> <li>1. Kišgeci, J. (2002): Hmelj. Pantenon, Beograd.</li> <li>2. Vratarić, M. i sur. (2004): Suncokret. Poljoprivredni institut Osijek.</li> <li>3. Vratarić, M. i Sudarić, A. (2008): Soja. Poljoprivredni institut Osijek.</li> <li>4. Websites with the aim of finding useful information related to new legal regulations related to agricultural production (Ministry of Agriculture, Official Gazette...)</li> </ol>		

<b>CEREALS</b>		
<b>Coordinator</b>	Mirta Rastija	
<b>Collaborators</b>	Dario Iljkić	
<b>Study year and semester</b>	First year, II. semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L + E + S)	75 (60 L + 10 S)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	Familiarizing students with the significance of cereals and their response to agroecological conditions, with an emphasis on abiotic stress, as well as the cultivation of cereals under stressful conditions and methods for overcoming these challenges.	
<b>Course enrolment requirements</b>	No enrolment requirements	
<b>Intended course learning outcomes</b>		
After the course has been successfully completed, the student will be able to		
<ol style="list-style-type: none"> <li>1. Explain the significance of cereals and their global role in food production.</li> <li>2. Describe the ontogeny of cereals and relate the stages of development, phases of organogenesis, phenological phases, and yield structure elements.</li> <li>3. Identify the specific needs of different cereals regarding agroecological conditions during their life cycle.</li> <li>4. Highlight the stress conditions and limiting factors for cereal cultivation.</li> <li>5. Plan and adapt the cultivation of cereals and the selection of cultivars based on the ecological conditions of a specific area.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
The right to take the final exam is achieved by collecting a minimum number of assessment points. Assessment points are achieved on the basis of attendance (minimum 70%), activities in classes and grades from partial exams. During the semester, students take three partial exams and submit a seminar paper. The final exam is mandatory, and a passing grade on the final exam is a prerequisite for achieving a passing overall grade. The final exam is oral.		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Kovačević, V., Rastija, M. (2014): Žitarice. Sveučilište J. J. Strossmayera u Osijeku, Poljoprivredni fakultet u Osijeku</li> <li>2. Pospišil, A. (2010): Ratarstvo, I. dio. Zrinski, d.d., Čakovec</li> <li>3. Pospišil, A., Pospišil, M. (2013): Ratarstvo – praktikum. Sveučilište u Zagrebu, Agronomski fakultet</li> <li>4. Gotlin, J., Pucarić, A. (1979) Specijalno ratarstvo (I. dio). Sveučilišna naklada Liber, Zagreb.</li> <li>5. Scientific and professional papers published in relevant domestic and foreign journals</li> </ol>		
<b>Additional literature</b>		
<ol style="list-style-type: none"> <li>1. Grupa autora (1986): Posebno ratarstvo (I. dio). Naučna knjiga, Beograd</li> <li>2. Heyne, E. G. (1987): Wheat and Wheat Improvement, Agronomy Monograph 13. American Society of Agronomy, Crop Science Society of America, Soil Science Society of America. Madison, Wisconsin, USA.</li> <li>3. Sprague, G. F., Dudley, J. W. (1988): Corn and corn improvement (third edition), ASA, CSSA, SSSA, Madison, Wisconsin, USA.</li> <li>4. Gooding, M.J., Davies, W.P. (1997): Wheat production and utilization. Systems, Quality and the Environment. CAB International. Wallingford, UK</li> </ol>		

<b>ARABLE CROPS BREEDING</b>		
<b>Coordinator</b>	Sonja Vila	
<b>Collaborators</b>	Sunčica Kujundžić	
<b>Study year and semester</b>	First year, II. semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L + E + S)	75 (35L + 10E + 30S)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	Familiarize students with classical breeding methods, basic goals in the selection of arable crops, and the possibility of combining classical breeding with biotechnological methods.	
<b>Course enrolment requirements</b>	No enrolment requirements	
<b>Intended course learning outcomes</b>		
<p>After the course has been successfully completed, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Plan the course of the breeding process for individual field crops according to their characteristics.</li> <li>2. Identify the breeding goals for specific field crops based on the current demands of producers, processors, and consumers.</li> <li>3. Outline the selection methods appropriate for field crops.</li> <li>4. Carry out the hybridization process of self-pollinating field crops, following the steps of the implementation methodology.</li> <li>5. Perform emasculation of the maternal component in self-pollinating field crops to prepare the maternal component for hybridization.</li> <li>6. Discuss, argue, and critically evaluate a given topic related to the breeding of field crops.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
<p>In shaping the final grade for students, continuous monitoring of classes is taken into account (class activity, preparation for class, reflective feedback on teaching content), seminar paper, and written exam. The assessment of the seminar paper includes clarity, accuracy, and relevance of the information presented in the paper, as well as the overall (technical and visual) quality of the presentation. Attendance is obligatory in accordance with the Ordinance on studies and studying at the J. J. Strossmayer University in Osijek.</p>		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Martinčić, J., Kozumplik, V. (1996): Oplemenjivanje bilja. Udžbenik. Sveučilište u Osijeku i Sveučilište u Zagrebu. (udžbenik)</li> <li>2. Kozumplik, V., Pejić, I. (2012): Monografija Oplemenjivanje poljoprivrednog bilja u Hrvatskoj. Agronomski fakultet Sveučilišta u Zagrebu.</li> <li>3. Martinčić, J., Marić, S. (1996): Oplemenjivanje bilja. Vježbovnik, Poljoprivredni fakultet u Osijeku (skripta)</li> <li>4. Vratarić, M., Sudarić, A. (2008): Soja. Drugo dopunjeno izdanje, Sveučilište J.J. Strossmayera, Poljoprivredni institut Osijek (udžbenik)</li> <li>5. Vratarić, M. (2004): Suncokret. Poljoprivredni institut Osijek. (udžbenik)</li> </ol> <p>During the course of classes, the latest papers published in reference international journals will be determined for the preparation of seminars</p>		
<b>Additional literature</b>		
<ol style="list-style-type: none"> <li>1. R.W. Allard (1999): Principles of plant breeding. John Wiley &amp; sons, INC.</li> </ol>		

<b>STORAGE OF ARABLE CROPS</b>		
<b>Coordinator</b>	Vlado Guberac	
<b>Collaborators</b>	Vedran Orkić	
<b>Study year and semester</b>	First year, II. semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L + E + S)	75 (30L + 45S)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	Get acquainted with the basics and methods of seed production of the most important arable species and the specificities of seed production by individual arable crops.	
<b>Course enrolment requirements</b>	No enrolment requirements	
<b>Intended course learning outcomes</b>		
<p>After the course has been successfully completed, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Analyze the differences in the seed composition of single-substrate and two-substrate seeds</li> <li>2. Choose the method for seed production according to the characteristics of the plant species</li> <li>3. Propose seed production process for individual arable crops</li> <li>4. Analyze the quality of seeds and planting material</li> <li>5. Commenting, reasoned and critical, on the given topic from the seed-keeping of arable crops</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
<p>In shaping the final grade for students, continuous monitoring of classes (class activity, preparation for the lesson, reflective feedback on teaching content), seminar work, and oral exam are taken into account. The evaluation of the seminar work includes clarity, accuracy, and relevance of the information presented in the written seminar, as well as the overall (technical and visual) quality of the presentation. Attendance is obligatory in accordance with the Ordinance on studies and studying at J. J. Strossmayer University in Osijek.</p>		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Milošević, M, Malešević, M (2004): Semenarstvo I i II. Monografija. Naučni institut za ratarstvo i povrtarstvo, Novi Sad.</li> <li>2. Milošević, M., Kobiljski, B. (2011): Semenarstvo I-III. Monografija. Institut za ratarstvo i povrtarstvo. Novi Sad.</li> </ol> <p>During the course of classes, the latest papers published in referenced international journals will be used for the preparation of seminars</p>		
<b>Additional literature</b>		
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<b>PRODUCTION PATTERNS OF VEGETABLES AND FLOWERS</b>		
<b>Coordinator</b>	Tomislav Vinković	
<b>Collaborators</b>	Zdenko Lončarić Vlado Guberac Monika Tkalec Kojić Boris Ravnjak	
<b>Study year and semester</b>	First year, II. semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L + E + S)	75 (45L + 25E + 5S)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	To familiarize students with the options for selecting models in the cultivation of vegetables and flowers in greenhouses, tunnels, and in the field, as well as with the methods of modern processes within this type of plant production. To acquaint students with the possibilities for choosing models in the modern cultivation of flowers in greenhouses, and in the field, as well as with the methods of modern processes within this type of plant production.	
<b>Course enrolment requirements</b>	No enrolment requirements	
<b>Intended course learning outcomes</b>		
After the course has been successfully completed, the student will be able to:		
<ol style="list-style-type: none"> <li>1. Identify and describe vegetable and flower cultures and classify them into groups based on the production model.</li> <li>2. Recommend a production model for a specific type based on agro-ecological and other environmental conditions.</li> <li>3. Recognize the drawbacks and advantages of a specific technology for the production of vegetables and flowers.</li> <li>4. Select and apply a specific production model based on the main characteristics of the species, cultivation media, and agro-ecological factors.</li> <li>5. Identify diseases and pests of vegetables and flowers and implement measures for their control.</li> <li>6. Manage the production process of vegetable and flower cultures and apply modern technical management systems.</li> <li>7. Forecast yields and ensure good quality of vegetable and flower produce through appropriate cultivation technology.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
The right to take the final exam is achieved by collecting a minimum number of assessment points. Assessment points are obtained based on class attendance (minimum 70%), participation in class activities, and grades from partial exams. During the semester, students take two partial exams (in the 7th and 15th week of classes). The final exam is mandatory, and a passing grade on the final exam is a prerequisite for a positive overall grade. The final exam is oral."		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Parađiković, N., Tkalec Kojić, M., Zeljković, S., Kraljičak, J., Vinković, T. (2018): Osnove florikulture, Poljoprivredni fakultet u Osijeku</li> <li>2. Parađiković, N. (2014): Opće i specijalno povrćarstvo – online skripta, Poljoprivredni fakultet u Osijeku</li> <li>3. Welbaum, G.E. (2015): Vegetable production and practices, CAB International, Wallingforth, Oxfordshire, UK</li> </ol>		
<b>Additional literature</b>		
<ol style="list-style-type: none"> <li>1. Parađiković, N., Tkalec Kojić, M., Zeljković, S., Kraljičak, J., Vinković, T. (2018): Osnove florikulture, Poljoprivredni fakultet u Osijeku</li> <li>1. Parađiković, N. (2014): Opće i specijalno povrćarstvo – online skripta, Poljoprivredni fakultet u Osijeku</li> <li>2. Welbaum, G.E. (2015): Vegetable production and practices, CAB International, Wallingforth, Oxfordshire, UK culture.</li> </ol>		

Plant production (University Graduate Study Programme)  
Major in **PLANT PRODUCTION**

<b>TECHNIQUES IN PLANT PRODUCTION</b>		
<b>Coordinator</b>	Đuro Banaj	
<b>Collaborators</b>	Vjekoslav Tadić, Anamarija Banaj	
<b>Study year and semester</b>	First year, II. semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L + E + S)	(49L + 26E)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	Familiarizing students with new achievements in the development of technical systems in plant production and the possibility of their application in new crop production technologies."	
<b>Course enrolment requirements</b>	No enrolment requirements	
<b>Intended course learning outcomes</b>		
<p>After the course has been successfully completed, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. List the basic tasks of technical systems in primary and supplementary soil management.</li> <li>2. Describe the factors that influence the selection of working machines and the possibility of their aggregation.</li> <li>3. List the basic systems and methods of their adjustments.</li> <li>4. Differentiate between technical systems, their types, and additional equipment on them.</li> <li>5. Choose technical systems based on the requirements of the applied cultivation technology</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
<p>The right to take the final exam is achieved by collecting a minimum number of assessment points. Assessment points are earned on the basis of attendance (minimum 70%), activities in classes and grades from partial exams. The final exam is mandatory, and a positive grade from the final exam is a prerequisite for a positive final grade. The final exam is written.</p>		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Banaj, Đ., Tadić, V., Banaj Željka, Lukač., P. (2013): Unapređenje tehnike aplikacije pesticida, Poljoprivredni fakultet u Osijeku, Osijek,</li> <li>2. Zimmer, R., Košutić, S., Zimmer, D. (2009.): Poljoprivredna tehnika u ratarstvu, Udžbenik Sveučilišta J. Strossmayera u Osijeku,</li> <li>3. Banaj, Đ., Šmrčković P. (2003): Upravljanje poljoprivrednom tehnikom, Poljoprivredni fakultet, Osijek, D. Brkić, M. Vujčić, L. Šumanovac, T. Jurić, P. Lukač, D. Kiš, D. Knežević (2005): „Eksploatacija poljoprivrednih strojeva”, udžbenik, Poljoprivredni fakultet u Osijeku, Osijek 2005., ISBN 631.316(075.8),</li> <li>4. Brkić, D., Vujčić, M., Šumanovac, L. (2002): Strojevi za žetvu i berbu zrnatih plodina, Poljoprivredni fakultet Osijek, Vinkovci</li> </ol>		
<b>Additional literature</b>		
<ol style="list-style-type: none"> <li>1. Znaor, D.: Ekološka poljoprivreda, Nakladni zavod Globus, Zagreb, 1996,</li> <li>2. Sito, S., Bilandžija, N. (2013): Tehnika u voćarstvu i vinogradarstvu, Interna skripta, Agronomski fakultet u Zagrebu,</li> <li>3. Lukač, P., Pandurović, T. (2011): Strojevi za berbu voća i grožđa, Poljoprivredni fakultet u Osijeku, Osijek</li> </ol>		

Plant production (University Graduate Study Programme)  
Major in **PLANT PRODUCTION**

<b>PROFESSIONAL WORK II</b>		
<b>Coordinator</b>	Andrijana Rebekić	
<b>Collaborators</b>		
<b>Study year and semester</b>	Second year, III. semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L+E+S)	75 (60L + 15S)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	Familiarize students with production practice through examples of real cases.	
<b>Course enrolment requirements</b>	No enrolment requirements	
<b>Intended course learning outcomes</b>		
<p>After successfully completing the course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Apply theoretical knowledge in practice in all important aspects of plant production.</li> <li>2. Determine the necessary agrotechnical measures in actual plant production.</li> <li>3. Identify existing problems in the actual plant production systems and propose improvements.</li> <li>4. To publicly present the findings of the research of the real case.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
<p>During their internship, students are required to maintain an internship journal. The journal's content includes lists and descriptions of work activities. Students must describe and graphically represent the organizational structure of the business entity, the operational units where the internship took place, along with a list and description of their activities. Students are expected to regularly monitor activities in legal entities engaged in agricultural production or registered family farms, detailing specific work tasks in which they were independently or mentor-guided participants.</p>		
<b>Obligatory literature</b>		
<b>Additional literature</b>		

# List of Teachers and Courses

Academic year 2022 - 23

Plant production

(University Graduate Study Programme)

Major in **PLANT NUTRITION AND SOIL SCIENCE**

A full-time Study Programme



Plant production (University Graduate Study Programme)

Major in **PLANT NUTRITION AND SOIL SCIENCE**

I. semester								
COORDINATOR	COURSE NAME	TEACHERS ON THE COURSE AND TYPE OF CLASSES						ECTS
		NAME AND SURNAME	LECTURES	SEMINARS	EXERCISES			
					FE	AE	LE	
Dražen Horvat	Biometrics	Dražen Horvat Andrijana Rebekić Sanja Grubišić Šestanj	45				15 15	6
Vesna Vukadinović	Pedogenesis and Soil Systematics	Vesna Vukadinović Domagoj Rastija Vladimir Zebec	30 25				10 10	6
Domagoj Rastija	Hydro- pedology	Domagoj Rastija Vladimir Zebec	50 5				20	6
Gabriella Kanižai Šarić	Microorganisms and plants	Gabriella Kanižai Šarić	40	10			25	6
Zdenko Lončarić	Patterned Plant Production	Zdenko Lončarić Domagoj Rastija Vladimir Ivezić	25 5 15	5 15			10	6
II. semester								
COORDINATOR	COURSE NAME	TEACHERS ON THE COURSE AND TYPE OF CLASSES						ECTS
		NAME AND SURNAME	LECTURES	SEMINARS	EXERCISES			
					FE	AE	LE	
Tihana Teklić	Physiology of Mineral Nutrition	Tihana Teklić Zdenko Lončarić Miroslav Lisjak	50 10				15	6
Vesna Vukadinović	Land resources	Vesna Vukadinović Boris Đurđević	50 5				20	6
Boris Đurđević	Fertilizers	Boris Đurđević Irena Jug Đuro Banaj	20 20 20				15	6

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Brigita Popović	Manures	Zdenko Lončarić Đuro Banaj Vladimir Ivezić Jurica Jović Brigita Popović	10 10 5 15 15	5 5			5 5	6
Vladimir Zebec	Soil productivity and Yield formation	Brigita Popović Vladimir Zebec	30 35				10	6
<b>III. semester</b>								
COORDINATOR	COURSE NAME	TEACHERS ON THE COURSE AND TYPE OF CLASSES						ECTS
		NAME AND SURNAME	LECTURES	SEMINARS	EXERCISES			
					FE	AE	LE	
	Elective course							6
	Elective course							6
	Elective course							6
	Elective course							6
<b>IV. semester</b>								
COORDINATOR	COURSE NAME	TEACHERS ON THE COURSE AND TYPE OF CLASSES						ECTS
		NAME AND SURNAME	LECTURES	SEMINARS	EXERCISES			
					FE	AE	LE	
Andrijana Rebekić	Practical work II	Andrijana Rebekić				75		6
	Master thesis							30

Plant production (University Graduate Study Programme)  
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<b>BIOMETRICS</b>		
<b>Coordinator</b>	Dražen Horvat	
<b>Collaborators</b>	Sanja Grubišić Šestanj	
<b>Study year and semester</b>	First year, I. semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L+E+S)	75 (45 L + 30 E)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	To present and interpret the basics of scientific theory and scientific conclusion to graduate students through the application of statistical methods and tests.	
<b>Course enrolment requirements</b>	No enrolment requirements	
<b>Intended course learning outcomes</b>		
After successfully completing the course, the student will be able to:		
<ol style="list-style-type: none"> <li>1. Recognize basic statistical terminology.</li> <li>2. Identify adequate experimental methods and techniques.</li> <li>3. Set the research aims and scientific hypothesis. Organize and monitor the experiment, collect the experimental data, determine the sample size, edit the statistical series and group the data.</li> <li>4. Calculate basic statistical parameters using descriptive statistical methods: measures of central tendency, measures of variation.</li> <li>5. Properly apply parametric tests, analysis of variance, correlation-regression analysis, test time series.</li> <li>6. Recognize and apply numerous diagrams as visual tools for presentations of experimental data.</li> <li>7. Properly select and apply statistical non-parametric methods and analysis.</li> <li>8. Recognize basics of software for statistical data analysis (Statistica, SAS).</li> <li>9. Develop statistical (scientific) rethinking based on the results obtained by statistical analysis.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
The right to take the final exam is obtained by accumulating a minimum number of assessment points. Assessment points are earned based on class attendance (at least 70%), class activities, and grades from partial exams. During the semester, students take two partial exams (in the 7th and 15th weeks of classes). The final exam is mandatory, and a passing grade on the final exam is a prerequisite for a passing overall grade. The final exam is oral.		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>3. Horvat, D., Ivezić, M. (2005): Biometrika u poljoprivredi. Poljoprivredni fakultet u Osijeku.</li> <li>4. Vasilj, Đ. (2000): Biometrika i eksperimentiranje u bilinogojstvu. Hrvatsko agronomsko društvo. Zagreb</li> </ol>		
<b>Additional literature</b>		
<ol style="list-style-type: none"> <li>4. Petz, B. (1985): Osnovne statističke metode za nematematičare. SNL, Zagreb.</li> <li>5. Hadživuković, S. (1991): Statistički metodi s primenom u poljoprivrednim i biološkim istraživanjima. Poljoprivredni fakultet, Novi Sad</li> <li>6. Mead, R., Curnow, R. N. and Hasted, A. M. (1993): Statistical Methods in Agriculture and Experimental Biology. Chapman &amp; Hall.</li> </ol>		

Plant production (University Graduate Study Programme)  
Major in **PLANT NUTRITION AND SOIL SCIENCE**

<b>PEDOGENESIS AND SOIL SYSTEMATICS</b>		
<b>Coordinator</b>	Vesna Vukadinović	
<b>Collaborators</b>	Domagoj Rastija Vladimir Zebec	
<b>Study year and semester</b>	First Year, First Semester	
<b>Number of credits and mode of delivery</b>	ECTS Credits:	6
	(L+E+S)	75 (55 L + 20 E)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	<i>To familiarize students with pedogenetic factors and their impact on processes within the pedosphere. Detailed introduction to Croatian soil classification, the basics of WRB (FAO/UNESCO) soil classification, and the suitability of Croatian soils for agricultural use.</i>	
<b>Course enrolment requirements</b>	None	
<b>Intended course learning outcomes</b>		
<p>Upon successful completion of the course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Recognize the morphological properties of soils on agricultural production areas.</li> <li>2. Identify, describe, and differentiate diagnostic soil horizons and associate them with specific soil types.</li> <li>3. Describe the basic physical-chemical properties of soil types.</li> <li>4. Identify soil types in the field.</li> <li>5. List the limitations of specific soil types for agricultural production and propose corrective measures.</li> <li>6. Present and compare the principles of soil classification according to WRB (FAO/UNESCO) and the Croatian system.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
<p>Students who earn the minimum number of assessment points during the semester have the right to take the final exam. Assessments points are collected based on class attendance (minimum 70%), class activities and grades from partial exams. During the semester, students take four partial exams (in the 4th, 9th, 12th and 16th week of classes). The final exam is oral and written, and a positive grade from the final exam is a prerequisite for a final positive grade. The final exam is obligatory.</p>		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Škorić, A. (1986): Postanak, razvoj i sistematika tala. Fakultet Poljoprivrednih znanosti. Zagreb.</li> <li>2. Husnjak, S. (2014): Sistematika tala Hrvatske. Hrvatska sveučilišna naknada. Zagreb.</li> <li>3. Bašić, F. (2013): The Soils of Croatia. World Soils Book Series. Springer.</li> <li>4. Martinović, J. (2000): Tla u Hrvatskoj. DUZPO. Zagreb.</li> <li>5. IUSS Working Group WRB (2022): World Reference Base for Soil Resources. International soil classification system for naming soils and creating legends for soil maps. 4<sup>th</sup> edition. International Union of Soil Sciences (IUSS), Vienna, Austria. <a href="https://www.fao.org/soils-portal/data-hub/soil-classification/world-reference-base/en/">https://www.fao.org/soils-portal/data-hub/soil-classification/world-reference-base/en/</a></li> <li>6. IUSS Working Group WRB (2015): World Reference Base for Soil Resources 2014, update 2015 - International soil classification system for naming soils and creating legends for soil maps. World Soil Resources Reports No. 106. FAO, Rome. FAO-ISRIC (2006): Guidelines for soil description – Fourth edition. Rome</li> </ol>		
<b>Additional literature</b>		
<ol style="list-style-type: none"> <li>1. Bogunović, M., Čorić, R. (2014): Višenamjensko vrednovanje zemljišta i racionalno korištenje prostora. Sveučilište u Mostaru. Mostar.</li> <li>2. Pernar, N., Bakšić, D., Perković, I. (2013): Terenska i laboratorijska istraživanja tla - priručnik za uzorkovanje i analizu. Šumarski fakultet Sveučilišta u Zagrebu, Hrvatske šume d.o.o.</li> <li>3. Resulović, H., Čustović, H., Čengić, I. (2008): Sistematika tla/zemljišta - Nastanak, svojstva i plodnost. Poljoprivredno-prehrambeni fakultet Univerziteta u Sarajevu. Sarajevo.</li> <li>4. Škorić, A., Bogunović, M., Martinović, J., Pelcer, Z., Racz, Z., Vidaček, Ž. (2003): Tla Gorske Hrvatske. Ministarstvo zaštite okoliša i prostornog uređenja, Ministarstvo znanosti i tehnologije. Zagreb – Osijek.</li> </ol>		

Plant production (University Graduate Study Programme)

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5. Herak, M. (1990): Geologija. Školska knjiga. Zagreb.
6. Škorić, A. (1987): Pedosfera Istre. Projektni Savjet pedološke karte SR Hrvatske. Zagreb.
7. Škorić, A. (1977): Tla Slavonije i Baranje. Projektni Savjet pedološke karte SR Hrvatske. Zagreb.
8. IUSS Working Group WRB (2006): World reference base for soil resources 2006. 2<sup>nd</sup> edition. World Soil Resources Reports No. 103. FAO, Rome. <https://www.fao.org/soils-portal/data-hub/soil-classification/world-reference-base/en/>
9. ISSS (1998): World reference base for soil resources. 84 World Soil Resources Report. FAO, Rome.
10. FAO-UNESCO (1988): Soil map of the world. Revised legend. World Soil Resources Report No. 60. Rome.

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<b>HYDROPEDODOLOGY</b>		
<b>Coordinator</b>	Domagoj Rastija	
<b>Collaborators</b>	Vladimir Zebec	
<b>Study year and semester</b>	First Year, First Semester	
<b>Number of credits and mode of delivery</b>	ECTS Credits:	6
	(L+E+S)	75 (55 L + 20 E)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	Introduce students to the various effects of the physical-chemical properties of soil on the processes of water infiltration, redistribution, and losses from the soil. They gain knowledge about the possibilities for improving soils with disrupted water-air relations through various agro-technical and hydro-technical amelioration measures.	
<b>Course enrolment requirements</b>	None	
<b>Intended course learning outcomes</b>		
<p>Upon successful completion of the course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Determine and describe basic hydropedological and pedophysical properties.</li> <li>2. Identify soil limitations regarding water deficiency or excess in the soil.</li> <li>3. Propose soil improvement measures through various agrotechnical and hydromelioration practices.</li> <li>4. Calculate elements of the soil water regime and the water requirements of plants.</li> <li>5. Collect and present data from professional and scientific literature.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
<p>The right to take the final exam is earned by accumulating minimum number of assessments points. Assessments points are obtained based on class attendance (at least 70%), participation in class activities, and grades from partial exams. During the semester, students take three partial exams (in weeks 6, 10, and 15 of the semester). The final exam is obligatory, and a passing grade on the final exam is a prerequisite for a positive final grade. The final exam is oral.</p>		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Husnjak, S. (2022): Osnove pedologije. Sveučilište u Zagrebu Agronomski fakultet</li> <li>2. Škorić, A. (1991): Sastav i svojstva tla. Fakultet Poljoprivrednih znanosti. Zagreb.</li> <li>3. Husnjak, S. (2014); Sistematika tala Hrvatske. Hrvatska sveučilišna naklada Zagreb</li> <li>4. Racz, Z. (1979): Predavanja iz meliorativne pedologije-I dio. Zagreb.</li> <li>5. Škorić, A. (1985): Postanak, razvoj i sistematika tala. Fakultet Poljoprivrednih znanosti. Zagreb.</li> <li>6. Vidaček, Ž. (1998): Gospodarenje melioracijskim sustavima odvodnje i natapanja. Agronomski fakultet Sveučilišta u Zagrebu.</li> <li>7. Kos, Z. i sur. (1993): Potrebe vode za navodnjavanje. Priručnik za hidrotehničke melioracije, II kolo, Knjiga 2. Građevinski fakultet Sveučilišta u Rijeci. Rijeka.</li> </ol>		
<b>Additional literature</b>		
<ol style="list-style-type: none"> <li>1. Kohnke, H. (1968): Soil physics. McGraw-Hill Book Company. New York.</li> <li>2. Kos, Z. (1989): Hidrotehničke melioracije tla - odvodnjavanje. Školska knjiga. Zagreb.</li> <li>3. Kos, Z. (1987): Hidrotehničke melioracije tla - navodnjavanje. Školska knjiga. Zagreb.</li> <li>4. Doorenbos, J., Pruitt, W.O. (1984): Crop water requirements. FAO. Irrigation and drainage paper, No. 24, Rome.</li> <li>5. Škorić, A. (1982): Priručnik za pedološka istraživanja. Fakultet Poljoprivrednih znanosti. Zagreb.</li> </ol>		

Plant production (University Graduate Study Programme)  
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<b>MICROORGANISMS AND PLANTS</b>		
<b>Coordinator</b>	Gabriella Kanižai Šarić	
<b>Collaborators</b>		
<b>Study year and semester</b>	First Year, First Semester	
<b>Number of credits and mode of delivery</b>	ECTS Credits:	6
	(L+E+S)	75 (40 L + 25 E + 10 S)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	To introduce Master's students to the general distribution and activity of microorganisms, as well as their essential and irreplaceable role in the life of plants.	
<b>Course enrolment requirements</b>	None	
<b>Intended course learning outcomes</b>		
<p>Upon successful completion of the course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Describe and differentiate the biological participants of the soil ecosystem.</li> <li>2. Explain the most significant microbiological processes in the cycle of major biogenic elements.</li> <li>3. Explain the importance of plant interactions with beneficial microorganisms.</li> <li>4. Differentiate, recommend, and apply microbiological preparations in specific agro-ecological conditions.</li> <li>5. Isolate and identify soil microorganisms.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
<p>The right to take the final exam is earned by accumulating minimum number of assessments points. Assessments points are obtained based on class attendance (at least 70%), participation in class activities and exercises, writing and presenting seminars, and grades from partial exams. During the semester, students take two partial exams. The final exam is obligatory, and a passing grade on the final exam is a prerequisite for obtaining a positive final grade. The final exam is oral.</p>		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Đukić, D.A., Jemcević, V.T., Kuzmanova, J. (2007): Biotehnologija zemljišta. Univerzitet u Kragujevcu, Agronomski fakultet u Čačku.</li> <li>2. Lalević B., Hamidović S., Komlen V. (2020): Građa i funkcija mikroorganizama u agroekosistemu. Agromedicinski fakultet Univerziteta Džemal Bijedić u Mostaru</li> </ol> <p>Tate, R.T.(2000): Soil Microbiology, Wiley, SAD.</p>		
<b>Additional literature</b>		
<ol style="list-style-type: none"> <li>1. Varnam, A.H., Evans, M.G. (ur.) (2000): Environmental Microbiology, Manson Publishing Ltd, London.</li> </ol>		

Plant production (University Graduate Study Programme)  
Major in **PLANT NUTRITION AND SOIL SCIENCE**

<b>PATTERNED PLANT PRODUCTION</b>		
<b>Coordinator</b>	Zdenko Lončarić	
<b>Collaborators</b>	Domagoj Rastija Vladimir Ivezić	
<b>Study year and semester</b>	First Year, First Semester	
<b>Number of credits and mode of delivery</b>	ECTS Credits:	6
	(L+E+S)	75 (45 L+10 E+20S)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	Familiarize students with the basics of computer modeling, the analytical aspects of crop production systems, and the mathematical description of the elements and interconnections of the system. Develop a simulation model based on the properties of agro-ecosystems, especially soil, physiological processes in plants, and the interaction between soil and plants, with a particular emphasis on nutrient uptake and yield formation.	
<b>Course enrolment requirements</b>	None	
<b>Intended course learning outcomes</b>		
<p>Upon successful completion of the course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Explain the types and levels of systems, boundaries, elements, and properties of systems.</li> <li>2. Classify types and levels of models, as well as relationships within models, optimization methods, testing, and model validation.</li> <li>3. Explain the phases of development of simulation models.</li> <li>4. Describe the elements and properties of agro-ecosystems in terms of soil quality, basic physiological processes, plant growth and development, root growth, soil moisture, and nutrient uptake.</li> <li>5. Describe the purpose, structure, and functionality of existing models.</li> <li>6. Collect an initial data set for describing the system and translate the system description into a mathematical model.</li> <li>7. Test the simulation model in crop production using the existing data set and then validate it with a new data set.</li> <li>8. Explain the advantages and disadvantages, areas, and methods of applying simulation models in crop production.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
The right to take the final exam is earned by accumulating minimum number of assessments points. Assessments points are obtained based on class attendance (at least 70%), participation in class activities and exercises, writing and presenting seminars, and grades from partial exams. The final exam is obligatory, and a passing grade on the final exam is a prerequisite for obtaining a positive final grade. The final exam is oral.		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Lončarić, Z. (2010): Modeliranje biljne proizvodnje. Poljoprivredni fakultet u Osijeku. Interna skripta.</li> </ol>		
<b>Additional literature</b>		
<ol style="list-style-type: none"> <li>1. Lončarić, Z. (1999): Matematičko modeliranje rodnosti ozime pšenice. Doktorska disertacija. Poljoprivredni fakultet u Osijeku. Osijek.</li> <li>2. Driessen, P.M. (1986): The Q.L.E. primer. A first introduction to quantified land evaluation procedures. Agricultural University, Wageningen, The Netherlands.</li> <li>3. Hanks, J., Ritchie, J.T. (1991): Modelling Plant and Soil Systems. Number 31 in the series Agronomy. ASA, CSSA, SSSA. Madison, Wisconsin, USA.</li> <li>4. Boote, K.J., Loomis, R.S. (1991): Modeling Crop Photosynthesis – from biochemistry to Canopy. CSSA Special Publication Number 19. CSSA, ASA. Madison, Wisconsin, USA.</li> <li>5. Jones, J.W., Mishoe, J.W., Boote, K.J. (1987): Introduction to simulation and modeling. Food&amp;Fertilizer Technology Center. Technical Bulletin 100.</li> <li>6. Rengel, Z. (1993): Mechanistic simulation models of nutrient uptake: A review. Plant and Soil 152: 161-173.</li> </ol>		



Plant production (University Graduate Study Programme)  
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<b>PHYSIOLOGY OF MINERAL NUTRITION</b>		
<b>Coordinator</b>	Tihana Teklić	
<b>Collaborators</b>	Zdenko Lončarić Miroslav Lisjak	
<b>Study year and semester</b>	First Year, Second Semester	
<b>Number of credits and mode of delivery</b>	ECTS Credits:	6
	(L+E+S)	75 (60 L+15 E)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	To familiarize students with the uptake, transport, and role of specific elements of mineral nutrition in physiological processes in plants, as well as the significance of agro-ecological conditions for plant nutrition. Through selected plant material analyses in the laboratory, students will be introduced to key indicators of plants' ability to absorb and transform elements of mineral nutrition in plant metabolism.	
<b>Course enrolment requirements</b>	None	
<b>Intended course learning outcomes</b>		
<p>Upon successful completion of the course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Describe the specifics of macro- and micronutrients and other elements that plants absorb from the environment during growth and development.</li> <li>2. Differentiate plant nutrient requirements depending on the plant species and developmental stage.</li> <li>3. Comment on the impact of specific nutrients on particular processes in plant metabolism.</li> <li>4. Integrate theoretical knowledge with practical procedures for analyzing plant samples.</li> <li>5. Assess the impact of ecological factors on the dynamics of nutrient uptake, accumulation, and functionality in plant metabolism.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
<p>The right to take the final exam is earned by accumulating minimum number of assessments points. Assessments points are obtained based on class attendance (at least 70%), participation in class activities, and grades from partial exams. During the semester, students take two partial exams (in the 10th and 15th week of classes). The final exam is obligatory, and a passing grade on the final exam is a prerequisite for obtaining a positive final grade. The final exam is written.</p>		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Lazarević, B., Poljak, M. (2019): Fiziologija bilja. Agronomski fakultet, Zagreb.</li> <li>2. Kastori, R., Maksimović, I. (2008): Ishrana biljaka. Vojvođanska akademija nauka i umetnosti. Novi Sad.</li> <li>3. Vukadinović, V., Lončarić, Z. (1997): Ishrana bilja. II izmjenjeno I dopunjeno izdanje. Poljoprivredni fakultet Osijek.</li> <li>4. Lisjak, M., Špoljarević, M., Agić, D., Andrić, L. (2009): Praktikum iz fiziologije bilja. Poljoprivredni fakultet Osijek.</li> </ol> <p>Maksimović, I., Pajević, S. (2002): Praktikum iz fiziologije biljaka. Poljoprivredni fakultet u Novom Sadu.</p>		
<b>Additional literature</b>		
<ol style="list-style-type: none"> <li>1. Pevalek-Kozlina, B. (2003): Fiziologija bilja. Profil International. Zagreb.</li> </ol>		

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<b>LAND RESOURCES</b>		
<b>Coordinator</b>	Vesna Vukadinović	
<b>Collaborators</b>	Boris Đurđević	
<b>Study year and semester</b>	First Year, Second Semester	
<b>Number of credits and mode of delivery</b>	ECTS Credits:	6
	(L+E+S)	75 (55L + 20E)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	Students will learn about soil resources by studying the properties and quality of soil, methods for determining its suitability for specific purposes, types and methods of land management and land-use planning, as well as processes of degradation, restoration, and methods for soil repair and protection.	
<b>Course enrolment requirements</b>	None	
<b>Intended course learning outcomes</b>		
<p>Upon successful completion of the course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Explain the functions of soil in agriculture and the economy in general.</li> <li>2. Recognize and clarify the impact of ecological disturbances on soil quality.</li> <li>3. List and interpret the morphological, biological, physical, and chemical properties of soil.</li> <li>4. Critically analyze the effects of degradation processes on soil and plan changes in land management practices.</li> <li>5. Define the minimum requirements for land use.</li> <li>6. Determine the optimal method for land use.</li> <li>7. List, explain, and apply methods for assessing land suitability.</li> <li>8. Classify soil/land into specific categories based on land suitability assessment criteria.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
Students are eligible to take the final exam if they accumulate the minimum assessments points during the semester. Assessments points are obtained based on class attendance (at least 70%), participation in class activities, and grades from partial exams. During the semester, students take two partial exams (in the 8th and 16th week of classes). The final exam consists of both oral and written components, and a passing grade on the final exam is required for a positive final grade. The final exam is obligatory.		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Vukadinović, V., Vukadinović, V. (2018): Zemljišni resursi – vrednovanje poljoprivrednih zemljišnih resursa. e-knjiga. <a href="http://pedologija.com.hr/Literatura/Zemljsni_resursi.pdf">http://pedologija.com.hr/Literatura/Zemljsni_resursi.pdf</a></li> <li>2. Jug, I., Jug, D., Brozović, B., Vukadinović, V., Đurđević, B. (2022): Osnove tloznanstva i biljne proizvodnje. Fakultet agrobiotehničkih znanosti Osijek. Sveučilište Josipa Jurja Strossmayera u Osijeku, Osijek.</li> <li>3. Vukadinović, V., Vukadinović, V. (2011): Ishrana bilja. Poljoprivredni fakultet u Osijeku. Osijek.</li> <li>4. Bogunović, M., Ćorić, R. (2014): Višenamjensko vrednovanje zemljišta i racionalno korištenje prostora. Sveučilište u Mostaru. Mostar.</li> <li>5. Jurišić, M., Plaščak, I. (2009): Geoinformacijski sustav, GIS u poljoprivredni i zaštiti okoliša. Poljoprivredni fakultet u Osijeku. Osijek.</li> <li>6. FAO (1976): A Framework for Land Evaluation. Food and Agriculture Organizations of the United Nations. Rome. <a href="http://www.fao.org/docrep/x5310e/x5310e00.htm">http://www.fao.org/docrep/x5310e/x5310e00.htm</a></li> <li>7. AZO (2008): Program trajnog motrenja tla. Projekt Izrada Programa trajnoga motrenja tala Hrvatske s pilot projektom LIFE05 TCY/CRO 000105. Agencija za zaštitu okoliša. Zagreb.</li> <li>Jug, D., Birkás, M., Kisić, I. (2015): Obrada tla u agroekološkim okvirima. Poljoprivredni fakultet u Osijeku, Sveučilište Josipa Jurja Strossmayera u Osijeku.</li> </ol>		
<b>Additional literature</b>		
<ol style="list-style-type: none"> <li>1. Pernar, N. Bakšić, D., Perković, I. (2013.): Terenska i laboratorijska istraživanja tla - priručnik za uzorkovanje i analizu. Šumarski fakultet Sveučilišta u Zagrebu, Hrvatske šume d.o.o.</li> </ol>		

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2. Đurđević, B. (2014.): Praktikum iz ishrane bilja. Sveučilište J.J. Strossmayera u Osijeku, Poljoprivredni fakultet u Osijeku. Osijek.
3. Kalogirou, S. (2002): Expert systems and GIS: an application of land suitability evaluation. Computers, Environment and Urban Systems. 26: 89-112.
4. Frančula N. (2004): Digitalna kartografija - treće prošireno izdanje. Sveučilište u Zagrebu, Geodetski fakultet. Zagreb.
5. Husnjak, S. (2014): Sistematika tala Hrvatske. Hrvatska sveučilišna naknada. Zagreb.
6. FAO (1996): Agro-ecological Zoning, Guidelines. Food and Agriculture Organizations of the United Nations. Rome. <http://www.fao.org/docrep/w2962e/w2962e00.htm>
7. FAO (1993): Guidelines for land-use planning. FAO Development Series 1. Rome.

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<b>FERTILIZERS</b>		
<b>Coordinator</b>	Boris Đurđević	
<b>Collaborators</b>	Irena Jug Đuro Banaj	
<b>Study year and semester</b>	First Year, Second Semester	
<b>Number of credits and mode of delivery</b>	ECTS Credits:	6
	(L+E+S)	75 (60 L+ 15 E)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	To familiarize students with the role, production, and application of mineral fertilizers, as well as their environmental impact.	
<b>Course enrolment requirements</b>	None	
<b>Intended course learning outcomes</b>		
<p>Upon successful completion of the course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Define the impact of civilization's development on the application of different materials in fertilization.</li> <li>2. Describe the raw materials and production processes of mineral fertilizers.</li> <li>3. Describe the physical and chemical properties of mineral fertilizers and their impact on soil.</li> <li>4. Recognize the chemical and physiological effects of mineral fertilizers on the environment.</li> <li>5. Correctly select the technique for applying different types of mineral fertilizers (solid, liquid, and gaseous).</li> <li>6. Explain the physiological processes in plants and the role of individual elements in these processes.</li> <li>7. Describe the principles for determining fertilization needs.</li> <li>8. Calculate and correctly select fertilizers for agricultural production using advanced computer techniques.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
<p>Students are expected to attend classes regularly and actively participate in discussions during lectures and exercises. After each thematic unit, students will take a partial exam. Students are encouraged to take notes during lectures and prepare for the exam using the obligatory literature. PowerPoint presentations will be used during lectures to assist in explaining the discussed content. These presentations will be available in printed form (handouts) for students.</p> <p>The final grade will take into account continuous monitoring of the course (class participation, preparation for lessons, reflective commentary on lecture content) and the results of partial exams and the final exam. Class attendance is obligatory according to the Regulations for Studies at the J.J. Strossmayer University of Osijek. The final exam is obligatory.</p>		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Jug, I., Jug, D., Brozović, B., Vukadinović, V., Đurđević, B. (2022): Osnove tloznanstva i biljne proizvodnje, udžbenik. Fakultet agrobiotehničkih znanosti Osijek, Osijek, Hrvatska.</li> <li>2. Vukadinović, V., Bertić, B. (2013.): Filozofija gnojidbe – Sve što treba znati o gnojidbi, udžbenik. Autorska naklada, Osijek.</li> <li>3. Vukadinović, V., Vukadinović, V. (2011.): Ishrana bilja, udžbenik. Poljoprivredni fakultet u Osijeku. Osijek</li> <li>4. Đurđević, Boris (2014): Praktikum iz ishrane bilja. Osijek: Poljoprivredni fakultet u Osijeku, 2014 (priručnik)</li> </ol>		
<b>Additional literature</b>		
<ol style="list-style-type: none"> <li>1. Đurđević, Boris; Jug, Irena; Jug, Danijel; Vukadinović, Vesna; Stipešević, Bojan; Brozović, Bojana (2017): Primjena biougljena kao kondicionera tla – korak ka održivoj biljnoj proizvodnji. Osijek: Vijeće za istraživanja u poljoprivredi, (priručnik)</li> </ol>		

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<b>MANURES</b>		
<b>Coordinator</b>	Brigita Popović	
<b>Collaborators</b>	Đuro Banaj Vladimir Ivezić Jurica Jović Zdenko Lončarić	
<b>Study year and semester</b>	First Year, Second Semester	
<b>Number of credits and mode of delivery</b>	ECTS Credits:	6
	(L+E+S)	75 (55L + 10E + 10S)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	To introduce students to the properties of organic fertilizers and conditioners and their significance in plant nutrition and soil conditioning. The course covers types of organic fertilizers and conditioners, their production, application, and the analyses used to determine the quality of these materials.	
<b>Course enrolment requirements</b>	None	
<b>Intended course learning outcomes</b>		
<p>Upon successful completion of the course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Describe the classification of organic fertilizers, their effect on nutrient content in the soil, and their impact on soil organic matter.</li> <li>2. Explain the properties of organic fertilizers and conditioners.</li> <li>3. Describe the production process of solid and liquid manure, as well as microbiological fertilizers.</li> <li>4. Explain the composting process, the characteristics of composting materials, and the properties of compost.</li> <li>5. Define the processes of sideration and the mulching process using organic and inorganic mulches.</li> <li>6. Interpret the properties of conditioners and measures for soil conditioning.</li> <li>7. Describe agrotechnical procedures for the application of organic fertilizers and conditioners.</li> <li>8. Calculate the optimal quantity of organic fertilizers and conditioners and analyze the properties of organic fertilizers.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
<p>Students must accumulate minimum number of assessments points to be eligible for the final exam. Assessments points are earned based on class attendance (minimum 70%), active participation in class, and grades from partial exams. During the semester, students will take four partial exams, each one week after the completion of the corresponding thematic unit. The final exam is obligatory, and a positive grade in the final exam is a prerequisite for a positive final grade. The final exam is oral.</p>		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Vukadinović, V., Lončarić, Z. (1997): Ishrana bilja. Poljoprivredni fakultet Osijek. (udžbenik)</li> <li>2. Lončarić, Z.; Parađiković, N.; Popović, B.; Lončarić, R.; Kanisek, J. (2015): Priručnik Gnojidba povrća, organska gnojiva i kompostiranje, tematska cjelina organska gnojiva i kompostiranje</li> <li>3. Follet, R. F. (1987): Soil Fertility and Organic Matter as Critical Components of production Systems. SSSA Special Publication Number 19. SSSA, ASA. Madison, Wisconsin, USA. (knjiga)</li> <li>4. Adams, F. (1984): Soil acidity and liming. Number 12 in the series Agronomy. ASA, CSSA, SSSA. Madison, Wisconsin, USA. (knjiga)</li> <li>5. Epstein, E. (1997): The Science of Composting. Technomic, Basel. (knjiga)</li> <li>6. Banaj, Đ. Šmrčković, P. (2003): Upravljanje poljoprivrednom tehnikom. Poljoprivredni fakultet u Osijeku. Osijek (knjiga) Lončarić, Z. (2005): Analize organskih gnojiva i supstrata. Poljoprivredni fakultet u Osijeku. Osijek (interna skripta) (udžbenik)</li> </ol>		

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| 7. Vukadinović, V., Bertić, B. (2013.): Filozofija gnojidbe – Sve što treba znati o gnojidbi, udžbenik. Autorska naklada, Osijek |
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<b>Additional literature</b>
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| <ol style="list-style-type: none"><li>1. Magdoff, F.R., Tabatabai, M.A., Hanlon, E.A. (1996): Soil Organic Matter: Analysis and Interpretation. SSSA Special Publication Number 46. SSSA, Madison, Wisconsin, USA. (knjiga)</li><li>2. Bacon, P.E. (1995): Nitrogen Fertilization in the Environment. Marcel Dekker, Inc. New York, Basel, Hong Kong. (knjiga)</li><li>3. Westerman, R.L. (1990): Soil Testing and Plant Analysis. Third Edition. Number 3 in the Soil Science of America Book Series. SSSA, Madison, Wisconsin, USA. (knjiga)</li><li>4. Havlin, J.L., Jacobsen, J.S. (1994): Soil Testing: Prospects for Improving Nutrient Recommendations. SSSA Special Publication Number 40. SSSA, ASA, Madison, Wisconsin, USA. (knjiga) za tematske cjeline: 4</li><li>5. Allen, S.E. (1989): Chemical Analysis of Ecological Materials, 2nd ed. Blackwell Scientific Publication, Oxford. (knjiga)</li></ol> |
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<b>SOIL PRODUCTIVITY AND YIELD FORMATION</b>		
<b>Coordinator</b>	Vladimir Zebec	
<b>Collaborators</b>	Brigita Popović	
<b>Study year and semester</b>	First Year, Second Semester	
<b>Number of credits and mode of delivery</b>	ECTS Credits:	6
	(L+E+S)	75 (65 L+10 E)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	To familiarize students with soil productivity as part of the ecosystem and with methods for determining soil productivity with respect to its impact on yield formation. The course covers processes of plant growth and development, assimilate distribution, photoperiodism, and the influence of physiologically active substances on yield and its formation.	
<b>Course enrolment requirements</b>	None	
<b>Intended course learning outcomes</b>		
<p>Upon successful completion of the course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Identify the elements of soil productivity.</li> <li>2. Identify methods for determining soil productivity with respect to yield formation.</li> <li>3. Interpret the distribution of assimilates, plant growth, and development.</li> <li>4. Interpret phenophases and stages of organogenesis.</li> <li>5. Describe the importance of external factors for yield formation.</li> <li>6. Describe the influence of nutrients and physiologically active substances on yield formation.</li> <li>7. Describe the impact of stress on yield formation.</li> <li>8. Prepare a seminar on topics related to soil productivity and yield formation.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
<p>Students must accumulate a minimum number of assessments points to be eligible for the final exam. Assesments points are earned based on class attendance (minimum 70%), active participation in class, and grades from partial exams. During the semester, students will take two partial exams (in the 7th and 15th week of the course). The final exam is obligatory, and a positive grade in the final exam is a prerequisite for a positive final grade. The final exam is oral.</p>		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Vukadinović, V., Lončarić, Z. (1997): Ishrana bilja. Poljoprivredni fakultet Osijek. (udžbenik)</li> <li>2. Boote, K.J., Bennett, J.M., T.R. Sinclair, G.M. Paulsen (1994): Physiology and Determinati on of Crop Yield. ASA,CSSA,SSSA.</li> <li>3. Related Society Publicati ons. Madison, Wisconsin, USA.</li> <li>4. Lambers, H., Chapin, F.S., Pons, T.L. (1998): Plant physiological ecology. Springer – Verlag.</li> <li>5. Lončarić, Z. (2003): Program vježbi iz kolegija Ekofi zilogija. Prakti kum za studente. Poljoprivredni fakultet u Osijeku.</li> <li>6. 5. Reiss, C. (1994): Experiments in plant physiology. Prenti ce Hall.</li> </ol>		
<b>Additional literature</b>		
<ol style="list-style-type: none"> <li>1. Z. Rengel (2002): Handbook of Plant Growth. pH as the Master Variable. Marcel Dekker. New York. Basel.</li> <li>2. Doran, J.W., Jones, A.J. (1996): Methods for Assessing Soil Quality. SSSA Special Publicati on Number 49. SSSA. Madison,Wisconsin, USA.</li> <li>3. Wien, H.C. (1997): The Physiology of Vegetable Crops. CAB Internati onal. Wallingford, UK.</li> <li>4. Gooding, M.J., Davies, W.P. (1997): Wheat Producti on and uti lizati on. Systems, Quality and the Environment. CAB International. Wallingford, UK.</li> <li>Roger, M. J. R.(ed.) (2001): Handbook of plant ecophysiology techniques. Kluwer Academic Publishers.</li> </ol>		

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<b>PRACTICAL WORK II</b>		
<b>Coordinator</b>	Andrijana rebekić	
<b>Collaborators</b>	None	
<b>Study year and semester</b>	Second Year, Third Semester	
<b>Number of credits and mode of delivery</b>	ECTS Credits:	6
	(L+E+S)	75 (60L + 15S)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	The goal of the course is to familiarize students with the methodology of setting up and conducting field fertilization experiments and soil conditioning trials. Through practical fieldwork, students will learn the methods and procedures for taking soil and plant material samples. Furthermore, in the agrochemical laboratory, students will learn methods for basic and supplementary soil analysis, as well as plant material analysis, and the analysis of organic fertilizers and substrates. The acquired knowledge will be enhanced through the interpretation of analysis results and the calculation of fertilization recommendations.	
<b>Course enrolment requirements</b>	None	
<b>Intended course learning outcomes</b>		
<p>Upon successful completion of the course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Set up fertilization and soil conditioning trials in specific production conditions in the field.</li> <li>2. Analyze soil and plant material in the agrochemical laboratory.</li> <li>3. Analyze organic fertilizers and substrates in the agrochemical laboratory.</li> <li>4. Interpret the results of soil and plant material analyses, as well as the analysis of organic fertilizers and substrates.</li> <li>5. Calculate the optimal fertilization and the required quantities of materials for soil conditioning based on soil analysis results and production conditions.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
During their internship, students are required to maintain an internship journal. The journal's content includes lists and descriptions of work activities. Students must describe and graphically represent the organizational structure of the business entity, the operational units where the internship took place, along with a list and description of their activities. Students are expected to regularly monitor activities in legal entities engaged in agricultural production or registered family farms, detailing specific work tasks in which they were independently or mentor-guided participants.		
<b>Obligatory literature</b>		
<b>Additional literature</b>		



# List of Teachers and Courses

Academic year 2022 - 23

Plant production

(University Graduate Study Programme)

Major in **PLANT BREEDING AND SEED PRODUCTION**

A full-time Study Programme

Plant production (University Graduate Study Programme)

Major in **PLANT BREEDING AND SEED PRODUCTION**

I. semester								
COORDINATOR	COURSE NAME	TEACHERS ON THE COURSE AND TYPE OF CLASSES						ECTS
		NAME AND SURNAME	LECTURES	SEMINARS	EXERCISES			
					FE	AE	LE	
Dražen Horvat	Biometrics	Dražen Horvat Andrijana Rebekić Sanja Grubišić Šestanj	45				15 15	6
Vlado Guberac	Planning of Breeding Programs	Vlado Guberac	25	50				6
Sonja Petrović	Population Genetic	Sonja Petrović Andrijana Rebekić	30 10				20 15	6
Sonja Vila	Biotechnology in Plant Breeding	Sonja Vila Sonja Petrović Sunčica Kujundžić	25	30				20 6
Dejan Agić	Plant biochemistry and physiology	Drago Bešlo Tihana Teklić Dejan Agić		12 50				13 6
II. semester								
COORDINATOR	COURSE NAME	TEACHERS ON THE COURSE AND TYPE OF CLASSES						ECTS
		NAME AND SURNAME	LECTURES	SEMINARS	EXERCISES			
					FE	AE	LE	
Vlado Guberac	Genetic Resources and Biodiversity	Vlado Guberac	25	50				6
Sunčica Kujundžić	Selection methods	Sonja Vila Sonja Petrović Sunčica Kujundžić	10 25	25				15 6
Vlado Guberac	Seed production	Vlado Guberac Vedran Orkić	40	35				6
Vlado Guberac	Breeding for stress conditions	Vlado Guberac Sonja Vila	55 10	10				6

Plant production (University Graduate Study Programme)

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Sonja Vila	Plant Breeding and Seed Production in practice	Sonja Vila Sonja Petrović Sunčica Kujundžić	15	30 30			6	
<b>III. semester</b>								
COORDINATOR	COURSE NAME	TEACHERS ON THE COURSE AND TYPE OF CLASSES						ECTS
		NAME AND SURNAME	LECTURES	SEMINARS	EXERCISES			
					FE	AE	LE	
	Elective course						6	
	Elective course						6	
	Elective course						6	
	Elective course						6	
<b>IV. semester</b>								
COORDINATOR	COURSE NAME	TEACHERS ON THE COURSE AND TYPE OF CLASSES						ECTS
		NAME AND SURNAME	LECTURES	SEMINARS	EXERCISES			
					FE	AE	LE	
Andrijana Rebekić	Practical work II	Andrijana Rebekić			75		6	
	Master thesis						30	

Plant production (University Graduate Study Programme)  
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<b>BIOMETRICS</b>		
<b>Coordinator</b>	Dražen Horvat	
<b>Collaborators</b>	Sanja Grubišić Šestanj	
<b>Study year and semester</b>	First year, I. semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L+E+S)	75 (45 L + 30 E)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	To present and interpret the basics of scientific theory and scientific conclusion to graduate students through the application of statistical methods and tests.	
<b>Course enrolment requirements</b>	No enrolment requirements	
<b>Intended course learning outcomes</b>		
<p>After successfully completing the course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Recognize basic statistical terminology.</li> <li>2. Identify adequate experimental methods and techniques.</li> <li>3. Set the research aims and scientific hypothesis. Organize and monitor the experiment, collect the experimental data, determine the sample size, edit the statistical series and group the data.</li> <li>4. Calculate basic statistical parameters using descriptive statistical methods: measures of central tendency, measures of variation.</li> <li>5. Properly apply parametric tests, analysis of variance, correlation-regression analysis, test time series.</li> <li>6. Recognize and apply numerous diagrams as visual tools for presentations of experimental data.</li> <li>7. Properly select and apply statistical non-parametric methods and analysis.</li> <li>8. Recognize basics of software for statistical data analysis (Statistica, SAS).</li> <li>9. Develop statistical (scientific) rethinking based on the results obtained by statistical analysis.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
<p>The right to take the final exam is obtained by accumulating a minimum number of assessment points. Assessment points are earned based on class attendance (at least 70%), class activities, and grades from partial exams. During the semester, students take two partial exams (in the 7th and 15th weeks of classes). The final exam is mandatory, and a passing grade on the final exam is a prerequisite for a passing overall grade. The final exam is oral.</p>		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Horvat, D., Ivezić, M. (2005.): Biometrika u poljoprivredi. Poljoprivredni fakultet u Osijeku.</li> <li>2. Vasilj, Đ. (2000.): Biometrika i eksperimentiranje u bilinogojstvu. Hrvatsko agronomsko društvo. Zagreb</li> </ol>		
<b>Additional literature</b>		
<ol style="list-style-type: none"> <li>1. Petz, B. (1985.): Osnovne statističke metode za nematematičare. SNL, Zagreb. Hadživuković, S. (1991.): Statistički metodi s primenom u poljoprivrednim i biološkim istraživanjima. Poljoprivredni fakultet, Novi Sad</li> <li>2. Mead, R., Curnow, R. N. and Hasted, A. M. (1993.): Statistical Methods in Agriculture and Experimental Biology. Chapman &amp; Hall.</li> </ol>		

Plant production (University Graduate Study Programme)  
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<b>PLANNING OF BREEDING PROGRAMS</b>		
<b>Coordinator</b>	Vlado Guberac	
<b>Collaborators</b>		
<b>Study year and semester</b>	First year, I. semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L+E+S)	75 (25 L + 50 S)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	To enable applicants to plan a breeding program, combining knowledge from other modules as well. With appropriate literature, applicants will be able to independently process the given topics, and publish and orally present the scientific results.	
<b>Course enrolment requirements</b>	No enrolment requirements	
<b>Intended course learning outcomes</b>		
After successfully completing the course, the student will be able to:		
<ol style="list-style-type: none"> <li>1. Describe, explain and set the goal of breeding program</li> <li>2. Choose a method and set up an experiment in accordance with the breeding goal</li> <li>3. Identify and select appropriate parental components in crosses to create offspring</li> <li>4. Comment, argumentatively and critically the given topic about breeding programs.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
The final grade will be formed based on continuous monitoring of students during the classes (activity in class, preparation for class, reflective review of course contents), seminar work and oral exam. The evaluation of the seminar paper includes the clarity, accuracy, and relevance of the written text, as well as the overall (technical and visual) quality of the presentation. Attending classes is mandatory by the Ordinance on studies and studying at J.J. Strossmayer University in Osijek.		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Martinčić, J., Kozumplik, V. (1996): Oplemenjivanje bilja. Udžbenik. Sveučilište u Osijeku i Sveučilište u Zagrebu.</li> <li>2. Sleper, D.A. and Poehlman, J.M. (2006): Breeding Field Crops. Iowa State University Press.</li> </ol>		
During the lectures, the latest papers published in referenced international journals will be used for the preparation of seminars.		
<b>Additional literature</b>		

Plant production (University Graduate Study Programme)  
Major in **PLANT BREEDING AND SEED PRODUCTION**

<b>POPULATION GENETIC</b>		
<b>Coordinator</b>	Sonja Petrović	
<b>Collaborators</b>	Andrijana Rbekić	
<b>Study year and semester</b>	First year, I. semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L+E+S)	75 (40 L + 35 E)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	Acquaint students with the genetic structure and movements in the population depending on the fertilization system, the factors of evolution and breeding procedures, which in connection with the genetic basis of the variability of quantitative properties enables a better understanding of plant breeding and seed production.	
<b>Course enrolment requirements</b>	No enrolment requirements	
<b>Intended course learning outcomes</b>		
After successfully completing the course, the student will be able to:		
<ol style="list-style-type: none"> <li>1. Describe, recognize and apply the theoretical basis of Hardy Weinberg's equilibrium law in solving problem tasks</li> <li>2. Describe the sources of genetic variability in the population.</li> <li>3. Describe, distinguish and compare mechanisms, basic factors (mutations, genetic drift, selection, migration, reproduction methods) and their interactions that lead to differences within and between populations and have an impact on the genetic structure of the population.</li> <li>4. Explain the influence of genotype and environment on the phenotypic value of quantitative traits through the calculation of components and the analysis of genetic variance</li> <li>5. Apply principles of population genetics in the conservation of plant genetic resources and the planning of breeding programs</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
Continuous monitoring of classes (activity in class, preparation for class, reflective review of class content), and written and oral exam are taken into account in forming the final grade for students. Attending classes is mandatory by the Ordinance on studies and studying at J.J. Strossmayer University in Osijek.		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Wallace B. (1981): Basic Population Genetics, Columbia University, New York</li> <li>2. Katarina Borojević (1991): Geni i populacija, Forum, Novi Sad.</li> <li>3. Hartl, D.L., and A.G. Clark (1997): Principles of Population Genetics (2.ed.) Sinauer Ass., Inc., Sunderland.</li> <li>4. Lynch, M., and B. Walsh (1988.) Genetics and Analysis of Quantitative Traits. Sinauer Ass., Inc., Sunderland.</li> <li>5. Falconer, D.S., and T.F.C. Mackay (1996): Introduction to Quantitative Genetics (4.ed.) Longman Group Ltd., Essex.</li> </ol>		
<b>Additional literature</b>		
Reference journals: Theoretical and Applied Genetics, Nature, Euphytica, Crop Science, Plant Breeding, etc.		

Plant production (University Graduate Study Programme)  
Major in **PLANT BREEDING AND SEED PRODUCTION**

<b>BIOTECHNOLOGY IN PLANT BREEDING</b>		
<b>Coordinator</b>	Sonja Vila	
<b>Collaborators</b>	Sonja Petrović Sunčica Kujundžić	
<b>Study year and semester</b>	First year, I. semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L+E+S)	75 (25 L + 20 E + 30S)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	Familiarize applicants with the application of biotechnology in plant breeding and the possibilities of combining classical breeding with biotechnological methods.	
<b>Course enrolment requirements</b>	No enrolment requirements	
<b>Intended course learning outcomes</b>		
<p>After successfully completing the course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. To analyze the differences, advantages and disadvantages of biotechnological methods used in plant breeding</li> <li>2. Perform DNA isolation from plant leaf tissue</li> <li>3. Plan the DNA analysis procedure using SSR markers</li> <li>4. Operate the devices for carrying out plant genome analysis using PCR and electrophoresis</li> <li>5. To evaluate the differences of the tested genotypes based on the PCR reactions and separation using electrophoresis</li> <li>6. Comment, argumentatively and critically, on the assigned topic from plant biotechnology</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
The final grade will be formed based on continuous monitoring of students during the classes (activity in class, preparation for class, reflective review of course contents), seminar work and written exam. The evaluation of the seminar paper includes the clarity, accuracy, and relevance of the written text, as well as the overall (technical and visual) quality of the presentation. Attending classes is mandatory by the Ordinance on studies and studying at J.J. Strossmayer University in Osijek.		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Jelaska, Sibila (1994): Kultura biljnih stanica i tkiva. Školska knjiga. Zagreb.</li> <li>2. Nagata T (2008): Molecular marker systems in plant breeding and crop improvement. Springer-Verlag.</li> <li>3. A. Slater, N. Scott, M. Fowler (2003): Plant biotechnology. Oxford University Press. Oxford.UK. p. 346</li> <li>4. Newton, C.R. and Graham, G.A. (1997): PCR. Second edition. BIOS Scientific Publishers. Oxford, UK.</li> <li>5. Ambriović Ristov, Andreja (2007): Metode u molekularnoj biologiji. IRB, Zagreb.</li> </ol> <p>During the lectures, the latest papers published in referenced international journals will be used for the preparation of seminars.</p>		
<b>Additional literature</b>		
<ol style="list-style-type: none"> <li>1. Cullis, A.C. (2004): Plant genomics and proteomics. Wiley-Liss. USA</li> </ol>		

Plant production (University Graduate Study Programme)  
Major in **PLANT BREEDING AND SEED PRODUCTION**

<b>PLANT BIOCHEMISTRY AND PHYSIOLOGY</b>		
<b>Coordinator</b>	Drago Bešlo	
<b>Collaborators</b>	Dejan Agić Tihana Teklić	
<b>Study year and semester</b>	First year, I. semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L+E+S)	75 (62 L + 13 E)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	The aim of the course is to learn the structure and function of biological macromolecules, and to learn about catabolic and anabolic processes and their importance in plant development. Learn about the expression of genetic information, as well as the recognition of signals and information transmission, as well as the biosynthesis of hormones and secondary metabolites. Also, explain physiological processes and the importance of specific physiologically active components in the plant organism during the generative stage of organogenesis.	
<b>Course enrolment requirements</b>	No enrolment requirements	
<b>Intended course learning outcomes</b>		
After successfully completing the course, the student will be able to:		
<ol style="list-style-type: none"> <li>1. Differentiate between catabolic and anabolic processes in the cell.</li> <li>2. To connect the mechanism of regulation during the anabolic and catabolic reactions.</li> <li>3. Explain and compare metabolic processes during plant growth and development.</li> <li>4. Discuss the importance of storing and preserving information and the expression of certain genes.</li> <li>5. Summarize and understand the synthesis of flavonoids, coumarins and stilbenes</li> <li>6. Understand physiological processes during organogenesis</li> <li>7. Independently carry out certain analyzes of plant material</li> <li>8. Connect and correctly interpret the results obtained by laboratory analysis.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
The right to take the final exam is achieved by collecting a minimum number of assessment points. Assessment points are earned based on class attendance (at least 70%), participation in class activities, and grades from partial exams. During the semester, students take five partial exams (in the 3rd, 6th, 9th, 12th, and 15th weeks of semester). The final exam is mandatory, and a passing grade on the final exam is a prerequisite for a positive final grade. The final exam consists of a written and an oral component.		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Berg Jeremy M, Tymoczko John L., Stryer Lubert (2013), Biokemija, 6. izdanje engleskog i 1. izdanje hrvatsko, Školska knjiga, Zagreb</li> <li>2. Bešlo Drago (2014) Praktikum iz biokemije, Poljoprivredni fakultet u Osijeku.</li> <li>3. Elliot, H. W. (2004): Biochemistry and molecular biology. Oxford University Press.</li> <li>4. McMurry John and Castellion Mary (2003) Fundamentals General, Organic, and Biological Chemistry, Four Edition, Pentice hall, UK.</li> <li>5. Lisjak Miroslav, Špoljarević Marija, Agić Dejan, Andrić Luka (2009) Parktikum iz fiziologije bilja, Poljoprivredni fakultetu Osijeku.</li> <li>6. Teklić Tihana, Fiziologija bilja (2012), Poljoprivredni fakultet u Osijeku. Kastori Rudolf (1984) Fiziologija semena, Matica srpska, Novi Sad.</li> </ol>		
<b>Additional literature</b>		
<ol style="list-style-type: none"> <li>1. Alberts Bruce, Bray Dennis, Hopkin Karen, Johnson Alexander, Lewis Julian, Raff Martin, Roberts Keith, Peter Walter Peter (2004): Essential cell biology, Second Edition, Garland Science, UK.</li> <li>2. Buchanon, Gruissem, Jones (2000) Biochemistry and Molecular biology of Plants, American Society of Plant Biologist, USA.</li> </ol>		



Plant production (University Graduate Study Programme)  
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3. Gatto Gregory, Berg Jeremy M, Stryer Lubert Tymoczko John L- (2019): Biochemistry, 9th Edition, MACMILLAN  
Fenner, M. (ed.) (2000) Seeds. The ecology of regeneration in plant communities. CABI Publishing.

Plant production (University Graduate Study Programme)  
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<b>GENETIC RESOURCES AND BIODIVERSITY</b>		
<b>Coordinator</b>	Vlado Guberac	
<b>Collaborators</b>	-	
<b>Study year and semester</b>	First year, II. semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L+E+S)	75 (25 L + 50 S)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	Familiarize students with the significance of genetic resources and the ways they can be utilized in the breeding of cultivated plants.	
<b>Course enrolment requirements</b>	No enrolment requirements	
<b>Intended course learning outcomes</b>		
<p>After successfully completing the course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Use plant genetic resources as sources of new genes in the breeding process.</li> <li>2. Show the importance of preserving plant genetic resources for the future of food production in the world.</li> <li>3. Analyze the status of plant genetic resources at the local, regional and world level.</li> <li>4. Identify socio-economic aspects of conservation of plant genetic resources.</li> <li>5. Comment, argumentatively and critically, on the given topic about genetic resources.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
<p>The final grade will be formed based on continuous monitoring of students during the classes (activity in class, preparation for class, reflective review of course contents), seminar work and oral exam. The evaluation of the seminar paper includes the clarity, accuracy, and relevance of the written text, as well as the overall (technical and visual) quality of the presentation. Attending classes is mandatory by the Ordinance on studies and studying at J.J. Strossmayer University in Osijek.</p>		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Martinčić, J., Kozumplik, V. (1996): Oplemenjivanje bilja. Sveučilište u Osijeku i Sveučilište u Zagrebu.</li> <li>2. Martinčić, J., Marić, S. (1996): Oplemenjivanje bilja. Sveučilište u Osijeku.</li> <li>3. Fenner, M. (1993): Seeds. CAB International</li> <li>4. Hodgkin, T., Brown, A.H.D., van Hintum, Th.J.L., Morales, E.A.V. (1995): Core collections of plant genetic resources. Wiley and Sons.</li> <li>5. Black, M, Bewley Derek J., Halmer, P (2008): The Encyclopedia of Seeds. CABI International.</li> <li>6. Šugar, I. (1994): Crvena knjiga biljnih vrsta Republike Hrvatske. Ministarstvo graditeljstva i zaštite okoliša.</li> <li>7. Radović, J. (1999): Pregled stanja biološke i krajobrazne raznolikosti Hrvatske. Državna uprava za zaštitu prirode i okoliša.</li> </ol> <p>During the lectures, the latest papers published in referenced international journals will be used for the preparation of seminars.</p>		
<b>Additional literature</b>		

Plant production (University Graduate Study Programme)  
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<b>SELECTION METHODS</b>		
<b>Coordinator</b>	Sunčica Kujundžić	
<b>Collaborators</b>	Sonja Vila Sonja Petrović	
<b>Study year and semester</b>	First year, II. semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L+E+S)	75 (35 L + 15 E + 25 S)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	To acquaint students with the theory of selection and the method of selecting breeding methods, as well as the possibilities of their adaptation to the breeding goal.	
<b>Course enrolment requirements</b>	No enrolment requirements	
<b>Intended course learning outcomes</b>		
<p>After successfully completing the course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. To evaluate the factors that influence the implementation of the selection of a certain plant species</li> <li>2. Calculate the genetic gain from selection</li> <li>3. Apply a specific selection method appropriate to the plant species, the breeding goal and the available resources</li> <li>4. To interpret the importance of QTL mapping and the use of molecular markers in classical plant breeding</li> <li>5. Apply methods for the evaluation of parental components and offspring during the selection process</li> <li>6. Comment, argumentatively and critically, on the given topic from the selection methods.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
The final grade will be formed based on continuous monitoring of students during the classes (activity in class, preparation for class, reflective review of course contents), seminar work and written exam. The evaluation of the seminar paper includes the clarity, accuracy, and relevance of the written text, as well as the overall (technical and visual) quality of the presentation. Attending classes is mandatory by the Ordinance on studies and studying at J.J. Strossmayer University in Osijek.		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Martinčić, J., Kozumplik, V. (1996): Oplemenjivanje bilja. Udžbenik. Sveučilište u Osijeku i Sveučilište u Zagrebu, 420 stranica.</li> <li>2. I.Bos, P. Caligari (1995): Selection Methods in Plant Breeding. Chapman&amp;Hall. London. p.347</li> <li>3. M.D. Hayward, N.O. Bosemark, I. Romagosa (1993): Plant Breeding:Principles and prospects.Chapman&amp;Hall, London. p. 550.</li> </ol>		
<b>Additional literature</b>		
<ol style="list-style-type: none"> <li>1. Newbury, H.J. (2003): Plant molecular breeding. Blackwell Publishing</li> <li>2. Jain, H.K., Kharkwal, M.C. (2004): Plant breeding. Narosa Publishing House.</li> </ol>		

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<b>SEED PRODUCTION</b>		
<b>Coordinator</b>	Vlado Guberac	
<b>Collaborators</b>	Vedran Orkić	
<b>Study year and semester</b>	First year, II. semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L+E+S)	75 (40 L + 35 E)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	Familiarized students with the specifics of seed production in contrast to mercantile production and the methods of seed and planting material production.	
<b>Course enrolment requirements</b>	No enrolment requirements	
<b>Intended course learning outcomes</b>		
<p>After successfully completing the course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Analyze the differences in seed production of self-pollinating and cross-pollinating plants.</li> <li>2. Apply the appropriate seed production method according to the plant species.</li> <li>3. Comment on the advantages and disadvantages of different types of reproduction of plant species.</li> <li>4. To carry out varietal trials for the purpose of recognizing new genotypes and placing them on the varietal list.</li> <li>5. Comment, argumentatively and critically, on the given topic from seed production.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
<p>The final grade will be formed based on continuous monitoring of students during the classes (activity in class, preparation for class, reflective review of course contents), seminar work and oral exam. The evaluation of the seminar paper includes the clarity, accuracy, and relevance of the written text, as well as the overall (technical and visual) quality of the presentation. Attending classes is mandatory by the Ordinance on studies and studying at J.J. Strossmayer University in Osijek.</p>		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Guberac, V. (2000): Sjemenarstvo ratarskih kultura. Skripta. Poljoprivredni fakultet u Osijeku, 83 stranice.</li> <li>2. Milošević, M., Kobiljski, B. (2011): Semearstvo I-III. Monografija. Institut za ratarstvo i povrtarstvo. Novi Sad.</li> <li>3. Skender, Ana, Knežević, Mira, Đurkić, Marija, Martinčić, J., Guberac, V., Kristek, A., Stjepanović, M., Bukvić, Gordana, Matotan, Z., Šilješ, I., Ivezić, Marija, Raspudić, Emilija, Horvat, D., Jurković, Draženka, Kalinović, Irma i Šamota, D. (1998): Sjemenje i plodovi poljoprivrednih kultura i korova na području Hrvatske. Udžbenik. Sveučilište u Osijeku, Osijek, 224 stranice.</li> <li>4. Babasaheb B. Desai (2004): Seeds Handbook. Marcel Dekker, Inc.</li> <li>5. Zakon o sjemenu, sadnom materijalu i priznavanju sorti poljoprivrednog bilja. NN 140/05, 35/08, 55/11, 14/14</li> </ol> <p>During the lectures, the latest papers published in referenced international journals will be used for the preparation of seminars.</p>		
<b>Additional literature</b>		

Plant production (University Graduate Study Programme)  
Major in **PLANT BREEDING AND SEED PRODUCTION**

<b>BREEDING FOR STRESS CONDITIONS</b>		
<b>Coordinator</b>	Vlado Guberac	
<b>Collaborators</b>	Sonja Vila	
<b>Study year and semester</b>	First year, II. semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L+E+S)	75 (65 L + 10 S)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	The aim of the course is to acquaint students with breeding methods and methods of improving corn germplasm with a broader presentation of heterosis, heterotic groups and the interaction of genotype x environment with an emphasis on the adaptation of plants to stressful conditions.	
<b>Course enrolment requirements</b>	No enrolment requirements	
<b>Intended course learning outcomes</b>		
After successfully completing the course, the student will be able to:		
<ol style="list-style-type: none"> <li>1. Plan the selection of corn for resistance to stressful environmental conditions.</li> <li>2. Choose appropriate methods for carrying out selection of corn lines for the purpose of forming new hybrid combinations adaptable to stressful environmental conditions.</li> <li>4. Analyze correlations between inbred lines and hybrids for the most important economic properties of corn.</li> <li>5. Conduct experiments on corn lines in multi – environments.</li> <li>6. To single out the most important stress factors in corn production in a certain growing area.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
The final grade will be formed based on continuous monitoring of students during the classes (activity in class, preparation for class, reflective review of course contents), seminar work and oral exam. The evaluation of the seminar paper includes the clarity, accuracy, and relevance of the written text, as well as the overall (technical and visual) quality of the presentation. Attending classes is mandatory by the Ordinance on studies and studying at J. J. Strossmayer University in Osijek.		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Martinčić, J., Kozumplik, V. (1996): Oplemenjivanje bilja. Udžbenik. Sveučilište u Osijeku i Sveučilište u Zagrebu.</li> <li>2. Kozumplik, V., Pejić, I. (2012): Monografija Oplemenjivanje poljoprivrednog bilja u Hrvatskoj. Agronomski fakultet Sveučilišta u Zagrebu.</li> <li>3. Sleper, D.A. i Poehlman, J.M. (2006): Breeding Field Crops. Iowa State University Press.</li> </ol> <p>During the lectures, the latest papers published in referenced international journals will be used for the preparation of seminars.</p>		
<b>Additional literature</b>		

Plant production (University Graduate Study Programme)  
Major in **PLANT BREEDING AND SEED PRODUCTION**

<b>PLANT BREEDING AND SEED PRODUCTION IN PRACTICE</b>		
<b>Coordinator</b>	Sonja Vila	
<b>Collaborators</b>	Sonja Petrović Sunčica Kujundžić	
<b>Study year and semester</b>	First year, II. semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L+E+S)	75 (60 E + 15 S)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	Through practical work on the selection and in production and processing of seeds, students will be trained to conduct breeding experiments and the process of seed product processing.	
<b>Course enrolment requirements</b>	No enrolment requirements	
<b>Intended course learning outcomes</b>		
<p>After successfully completing the course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Create an experimental design plan for an individual plant species in accordance with the breeding goal and characteristics of the species.</li> <li>2. Select plants for the next generation of selection in accordance with the breeding goal.</li> <li>3. Solve a specific problem in selection process by applying appropriate methods.</li> <li>4. Analyze the possibilities of improving the selection process for a specific breeding goal.</li> <li>5. To carry out the approval of seed crops of the most important agricultural crops.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
<p>The final grade will be formed based on continuous monitoring of students during the classes (activity in class, preparation for class, reflective review of course contents), seminar work (problem task) and written exam. The evaluation of the seminar paper includes the clarity, accuracy, and relevance of the written text, as well as the overall (technical and visual) quality of the presentation. Attending classes is mandatory by the Ordinance on studies and studying at J. J. Strossmayer University in Osijek.</p>		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Martinčić, J., Kozumplik, V. (1996): Oplemenjivanje bilja. Udžbenik. Sveučilište u Osijeku i Sveučilište u Zagrebu, 420 stranica.</li> <li>2. I.Bos, P. Caligari (1995): Selection Methods in Plant Breeding. Chapman&amp;Hall. London. p.347</li> <li>3. Poehlman, J.M. i Sleper, D.A. (1995): Breeding Field Crops. Iowa State University Press.</li> <li>4. Mirjana Milošević i B. Kobiljski (2011): Semenarstvo. Monografija. Institut za ratarstvo i povrtlarstvo, Novi Sad.</li> </ol> <p>During the lectures, the latest papers published in referenced international journals will be used for the preparation of seminars.</p>		
<b>Additional literature</b>		

Plant production (University Graduate Study Programme)  
Major in **PLANT BREEDING AND SEED PRODUCTION**

<b>PRACTICAL WORK II</b>		
<b>Coordinator</b>	Ranko Gantner	
<b>Collaborators</b>	Sonja Petrović Sunčica Kujundžić Tihomir Čupić	
<b>Study year and semester</b>	First year, III. semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L+E+S)	75 (75 E)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	Educate students for the practical performance of hybridization, generative and vegetative multiplication of cultivars of agricultural, industrial and fodder plants, for the cultivation of obtained clones in large-scale production and for the production of seeds.	
<b>Course enrolment requirements</b>	No enrolment requirements	
<b>Intended course learning outcomes</b>		
After successfully completing the course, the student will be able to:		
<ol style="list-style-type: none"> <li>1. Plan the scheme of the breeding experiment and carry out its sowing.</li> <li>2. Implement procedures in the process of creating lines.</li> <li>3. Carry out the production of seed crops.</li> <li>4. Carry out approval of seed crops.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
Students are expected to continuously attend practical work classes. Going to practical work is mandatory. Regular attendance at classes and a practical work diary signed by my mentor are conditions for successfully passing the Practical work II course.		
<b>Obligatory literature</b>		
<b>Additional literature</b>		

# List of Teachers and Courses

Academic year 2022 - 23

Plant production

(University Graduate Study Programme)

Major in **PLANT PROTECTION**

A full-time Study Programme





Plant production (University Graduate Study Programme)

Major in **PLANT PROTECTION**

Vlatka Rozman	Storage of Agricultural Products	Vlatka Rozman Anita Liška Pavo Lucić Marija Ravlić	25 20 10	15		5		6
Edita Štefanić	Weeds	Edita Štefanić Sanda Rašić	45			10	10	10 6
<b>III. semester</b>								
COORDINATOR	COURSE NAME	TEACHERS ON THE COURSE AND TYPE OF CLASSES						ECTS
		NAME AND SURNAME	LECTURES	SEMINARS	EXERCISES			
					FE	AE	LE	
	Elective course							6
	Elective course							6
	Elective course							6
	Elective course							6
<b>IV. semester</b>								
COORDINATOR	COURSE NAME	TEACHERS ON THE COURSE AND TYPE OF CLASSES						ECTS
		NAME AND SURNAME	LECTURES	SEMINARS	EXERCISES			
					FE	AE	LE	
Andrijana Rebekić	Practical work II	Andrijana Rebekić				75		6
	Master thesis							30

<b>BIOMETRICS</b>		
<b>Coordinator</b>	Dražen Horvat	
<b>Collaborators</b>	Sanja Grubišić Šestanj	
<b>Study year and semester</b>	First year, I. semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L+E+S)	75 (45 L + 30 E)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	To present and interpret the basics of scientific theory and scientific conclusion to graduate students through the application of statistical methods and tests.	
<b>Course enrolment requirements</b>	No enrolment requirements	
<b>Intended course learning outcomes</b>		
<p>After successfully completing the course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Recognize basic statistical terminology.</li> <li>2. Identify adequate experimental methods and techniques.</li> <li>3. Set the research aims and scientific hypothesis. Organize and monitor the experiment, collect the experimental data, determine the sample size, edit the statistical series and group the data.</li> <li>4. Calculate basic statistical parameters using descriptive statistical methods: measures of central tendency, measures of variation.</li> <li>5. Properly apply parametric tests, analysis of variance, correlation-regression analysis, test time series.</li> <li>6. Recognize and apply numerous diagrams as visual tools for presentations of experimental data.</li> <li>7. Properly select and apply statistical non-parametric methods and analysis.</li> <li>8. Recognize basics of software for statistical data analysis (Statistica, SAS).</li> <li>9. Develop statistical (scientific) rethinking based on the results obtained by statistical analysis.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
<p>The right to take the final exam is obtained by accumulating a minimum number of assessment points. Assessment points are earned based on class attendance (at least 70%), class activities, and grades from partial exams. During the semester, students take two partial exams (in the 7th and 15th weeks of classes). The final exam is mandatory, and a passing grade on the final exam is a prerequisite for a passing overall grade. The final exam is oral.</p>		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>5. Horvat, D., Ivezić, M. (2005): Biometrika u poljoprivredi. Poljoprivredni fakultet u Osijeku.</li> <li>6. Vasilj, Đ. (2000): Biometrika i eksperimentiranje u bilinogojstvu. Hrvatsko agronomsko društvo. Zagreb</li> </ol>		
<b>Additional literature</b>		
<ol style="list-style-type: none"> <li>7. Petz, B. (1985): Osnovne statističke metode za nematematičare. SNL, Zagreb.</li> <li>8. Hadživuković, S. (1991): Statistički metodi s primenom u poljoprivrednim i biološkim istraživanjima. Poljoprivredni fakultet, Novi Sad</li> <li>9. Mead, R., Curnow, R. N. and Hasted, A. M. (1993): Statistical Methods in Agriculture and Experimental Biology. Chapman &amp; Hall.</li> </ol>		

<b>Phytopathology II</b>		
<b>Coordinator</b>	Jasenka Ćosić	
<b>Collaborators</b>	Karolina Vrandečić Tamara Siber	
<b>Year and semester</b>	First year, 1st semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L+P+S)	75 (70P+5V)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	To introduce graduate students to the systematics of fungi and some representatives of important genera, physiological changes in diseased plants, defense mechanisms, epidemiology and the basics of mycotoxicology.	
<b>Course enrolments requirements</b>	No requirements	
<b>Intended course learning outcomes</b>		
Upon successful completion of the module, students will be able to:		
<ol style="list-style-type: none"> <li>1. List the systematic units of fungi and describe their characteristics</li> <li>2. List and describe changes in the metabolism of diseased plants and their defense mechanisms</li> <li>3. Describe and explain the principles of plant resistance</li> <li>4. Explain changes in parasitic properties of pathogens</li> <li>5. Describe the structure of bacteria and viruses, ways of infection, how they enter the plant organism and symptoms on plants</li> <li>6. Group toxicogenic fungi and their associated toxins</li> <li>7. Describe the changes caused by mycotoxins in consumers</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
The right to take the final exam is achieved by collecting the minimum number of assessment points. Assessment points are earned on the basis of attendance (minimum 70%), class activities and grades from partial exams. During the semester, students take three partial exams (in the 5th, 10th and 15th week of classes). The final exam is mandatory, and a positive grade from the final exam is a prerequisite for a positive overall grade. The final exam is oral.		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Agrios, G.N. (2005): Plant Pathology. Edition, 5. Publisher, Academic Press.</li> <li>2. Kišpatić, J. (1992): General phytopathology. Faculty of Agriculture, Zagreb.</li> <li>3. Ožegović, L., Pepeljnjak, S. (1995.): Mycotoxicosis. Školska knjiga, Zagreb.</li> <li>4. Šutić, D. (1995): Anatomy and physiology of diseased plants. Nolit, Belgrade.</li> </ol>		
<b>Additional literature</b>		
<ol style="list-style-type: none"> <li>1. Brmež, M., Ćosić, J., Raspudić, E., Baličević, R., Liška, A., Majić, I., Ilić, J., Sarajlić, A., Lucić, P., Ravlić, M., Puškarić, J. (2019): Environmentally Friendly Plant Protection. Faculty of Agrobiotechnical Sciences Osijek.</li> <li>2. Juretić, N. (1999): Basics of Plant Virology. Školska knjiga Zagreb.</li> <li>3. Arsenijević, M. (1992): Phytopathogenic bacteria. Scientific book, Belgrade.</li> </ol>		

<b>PHYTONEMATOLGY</b>		
<b>Coordinator</b>	Mirjana Brmež	
<b>Collaborators</b>	Ivana Majić Josipa Puškarić	
<b>Year and semester</b>	First year, 1st semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L+P+S)	75 (50 L + 25 P)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	Introducing students to the problems of phytoparasitic nematodes in agriculture and the possibilities of their control, with the methods of sampling and extracting nematodes from the soil, with the interaction of nematodes and other organisms, nematodes as bioindicators, and entomopathogenic nematodes.	
<b>Course enrolments requirements</b>	No requirements	
<b>Intended course learning outcomes</b>		
<p>Upon successful completion of the module, students will be able to:</p> <ol style="list-style-type: none"> <li>1. Properly take a soil sample for nematological analyses, and independently extract from the soil cyst nematodes, properly process the sample, count and determine plant parasites.</li> <li>2. Describe the biology and ecology of nematodes.</li> <li>3. Recognize the symptoms on the plant that arise due to the attack of phytoparasitic nematodes.</li> <li>4. Categorize nematodes by site of attack on the plant, and describe root, stem, leaf and seed nematodes.</li> <li>5. Recommend a measures of protection against phytoparasitic nematodes.</li> <li>6. Assess the state of the agroecosystem through the nematode community by calculating indices used in nematology.</li> <li>7. Choose the most favorable entomopathogenic nematodes in protection against insects pests.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
<p>The right to take the final exam is granted to students who accumulate the minimum required assessment points. These points are earned through attendance (with a minimum requirement of 70%), participation in class activities, and grades from three partial exams conducted throughout the semester (in the 5th, 10th, and 15th weeks). The final exam is mandatory, and achieving a passing grade on this exam is necessary for obtaining a positive final grade. The final exam will be conducted orally.</p>		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Ivezić, M. (2014): <i>Phytonematology</i>. Grafika d.o.o. Osijek, p.p. 109.</li> <li>2. Ljerka Oštrec (1998): <i>Zoology</i>. Zrinski Čakovec (book) for thematic units: p.p. 232.</li> <li>3. Krnjajić, Đ., Krnjajić, S: (1987): <i>Phytonetology</i>. Nolit, Belgrade. p.p. 433.</li> <li>4. Bongers, T. (1994): <i>The nematodes of the Netherlands</i>. KNNV: Utrecht.</li> <li>5. Southey, J.F. (1970): <i>Laboratory methodes for work with plant and soil nematodes</i>. London (praktikum).</li> </ol>		
<b>Additional literature</b>		
Scientific and professional papers in the field of nematology		

<b>PHYTOPHARMACY</b>		
<b>Coordinator</b>	Renata Baličević	
<b>Collaborators</b>	Marija Ravlić	
<b>Year and semester</b>	First year, 1st semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L+P+S)	75 (50 L + 15 P + 10 S)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	Introducing students to the basic principles of plant health, plant protection measures, plant protection products and ways of controlling pests and diseases.	
<b>Course enrolments requirements</b>	No requirements	
<b>Intended course learning outcomes</b>		
<p>Upon successful completion of the module, students will be able to:</p> <ol style="list-style-type: none"> <li>1. Explain the importance of phytopharmacy in agricultural production</li> <li>2. Identify the goals of the proper application of plant protection products depending on the current requirements of producers, processors and consumers with the application of legal frameworks</li> <li>3. Apply selective plant protection methods depending on the pest or disease</li> <li>4. Know the mechanisms of action of plant protection products</li> <li>5. Carry out the proper application of plant protection products while preventing environmental contamination</li> <li>6. Comment, argumentatively and critically, on a given topic in plant protection</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
<p>Students may take the final exam upon accumulating the minimum required assessment points. These points are earned through a combination of attendance (with a minimum of 70%), participation in class activities, and grades from three partial exams administered throughout the semester. Additionally, students are required to prepare an independent seminar paper, which they must present orally for 10 to 15 minutes. The final exam is mandatory, and obtaining a passing grade on this exam is essential for achieving a positive final grade. The final exam will be conducted in an oral format."</p>		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Baličević R., Ravlić M. (2014): Herbicides in Plant Protection. J. J. Strossmayer University, Faculty of Agriculture in Osijek.</li> <li>2. F. Bagi, K., Bodnar (2012): Phytomedicine, University of Novi Sad, Faculty of Agriculture.</li> <li>3. R. Šovljanski, S. Lazić (2007): Basics of Phytopharmacy, University of Novi Sad, Faculty of Agriculture.</li> <li>4. Ravlić, M. (2017.): A collection of tasks from phytopharmacy. J. J. Strossmayer University, Faculty of Agriculture in Osijek.</li> <li>5. Igrc Barčić, J., Maceljjski, M. (2001): Environmentally Friendly Pest Plant Protection. Zrinski, Čakovec.</li> </ol>		
<b>Additional literature</b>		
<ol style="list-style-type: none"> <li>1. Journal of Plant Protection: List of Plant Protection Products in the Republic of Croatia;</li> <li>2. Scientific and professional papers from relevant journals and databases.</li> </ol>		

<b>PRACTICAL COURSE IN PLANT PROTECTION</b>		
<b>Coordinator</b>	Mirjana Brmež	
<b>Collaborators</b>	Jasenka Ćosić Karolina Vrandečić Renata Baličević	
<b>Year and semester</b>	First year, 1st semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L + E + S)	75 (55 L + 20 S)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	Determination of the main plant invertebrate, avian and mammal pests, pathogenic fungi and weeds. Recognizing the symptoms of an attack on the plant and appropriate protection measures.	
<b>Course enrolments requirements</b>	No requirements	
<b>Intended course learning outcomes</b>		
<p>Upon successful completion of the module, students will be able to:</p> <ol style="list-style-type: none"> <li>1. Identify pests in agriculture</li> <li>2. Recognize the symptoms of attacks from certain species of pests, diseases and weeds.</li> <li>3. Use different methods in the phytopathology laboratory</li> <li>4. Describe the modes of action of pesticides</li> <li>5. Recommend a protection plan for agricultural crops</li> <li>6. Choose the most favorable entomopathogenic nematodes in protection against harmful insects</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
<p>To qualify for the final exam, students must accumulate a minimum number of assessment points. These points are earned through attendance (with a minimum requirement of 70%), active participation in class activities, and grades from partial exams. Additionally, students are required to prepare a mandatory independent seminar paper, which must be presented orally for 10 to 15 minutes. The evaluation of the seminar paper considers the clarity, accuracy, and relevance of the written content, as well as the overall technical and visual quality of the presentation. The final exam is mandatory, and a passing grade on this exam is necessary to receive a positive final grade. The final exam will be conducted in an oral format."</p>		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Ivezić, M. (2008): Entomology – Insects and Other Pests in Agriculture, Josip Juraj Strossmayer University of Osijek, Faculty of Agriculture in Osijek</li> <li>2. Maceljiski, M. (2002): Agricultural entomology. Zrinski Čakovec</li> <li>3. Ivezić M. (2014): Phytonematology, Josip Juraj Strossmayer University of Osijek, Faculty of Agriculture in Osijek</li> <li>4. Raspudić E., Brmež M., Majić I., Sarajlić A. (2014): Insecticides in Plant Protection, Josip Juraj Strossmayer University of Osijek, Faculty of Agriculture in Osijek</li> <li>5. Journal of Plant Protection (selected issues)</li> <li>6. Jovičević, B., Milošević, M. (1990): Diseases of semen. Dnevnik, Novi Sad</li> <li>7. Knežević M. (2006): Atlas of weed, ruderal and grassland flora, J. J. Strossmayer University of Osijek, Faculty of Agriculture in Osijek.</li> <li>8. Baličević R., Ravlić M. (2014): Herbicides in Plant Protection , J. J. Strossmayer University of Osijek , Faculty of Agriculture in Osijek.</li> </ol>		
<b>Additional literature</b>		

<b>DISEASES OF ARABLE CROPS</b>		
<b>Coordinator</b>	Jasenska Ćosić	
<b>Collaborators</b>	Karolina Vrandečić Tamara Siber	
<b>Year and semester</b>	1st year, 2nd semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L+P+S)	75 (60L+5P+10S)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	To introduce students to the most important pathogens of small grains, corn, sunflower, soybeans, rapeseed, sugar beet and tobacco.	
<b>Course enrolments requirements</b>	No requirements	
<b>Intended course learning outcomes</b>		
<p>Upon successful completion of the module, students will be able to:</p> <ol style="list-style-type: none"> <li>1. Explain the impact of plant diseases on the yield of arable crops</li> <li>2. Identify the most important pathogens of agricultural diseases</li> <li>3. Describe the symptoms, biology and ecology of the pathogens</li> <li>4. Explain the influence of environmental factors and implemented agrotechnics on the occurrence of diseases</li> <li>5. Compare the symptoms of the same pathogen on different plant species</li> <li>6. Plan the implementation of protection measures</li> <li>7. Comment, argumentatively and critically, on the given topic of the seminar paper</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
<p>To qualify for the final exam, students must accumulate a minimum number of assessment points. These points can be earned through attendance (with a minimum requirement of 70%), active participation in class activities, and grades from two partial exams, which are held in the 8th and 15th weeks of the semester. Additionally, students must prepare a seminar paper, which they will present orally for 10 to 15 minutes. The seminar paper will be evaluated based on the clarity, accuracy, and relevance of the written content, as well as the overall technical and visual quality of the presentation. The final exam is mandatory, and obtaining a passing grade is essential for achieving a positive final grade. The final exam will be conducted in an oral format."</p>		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Agrios, G.N. (1997): Plant Pathology. Specific Plant Diseases. Academic Press, New York.</li> <li>2. Jurković, D., Ćosić, J., Vrandečić, K. (2016): Pseudofungi and fungi of arable crops. Faculty of Agriculture in Osijek.</li> </ol>		
<b>Additional literature</b>		
<ol style="list-style-type: none"> <li>1. Balaž, F.F., Balaž, J.S., Tošić, M.T., Stojšin, V.B., Bagi, F.F. (2010): Phytopathology – Diseases of Field and Vegetable Plants. University of Novi Sad, Faculty of Agriculture.</li> <li>2. Shaw, D.H., Lucas, G.B. (1991): Compendium of Tobacco Diseases. APS Press.</li> <li>3. Harveson, R.M., Hanson, L.E., Hein, G.L. (2009): Compendium of Beet Diseases and Pests. APS Press.</li> <li>4. Bockus, W.W., Bowden, R.L., Hunger, R.M., Morill, R.M., Murray, T.D., Smiley, R.W. (2010) Compendium of Wheat Diseases and Pests. APS Press.</li> </ol>		



Plant production (University Graduate Study Programme)  
Major in **PLANT PROTECTION**

<b>PLANT PROTECTION EXTENSION SERVICE</b>		
<b>Coordinator</b>	Vlatka Rozman	
<b>Collaborators</b>	Anita Liška, Marija Ravlić	
<b>Year and semester</b>	1st year, 2nd semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L+P+S)	75 (55L+20S)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	To introduce graduates to the importance of the extension service in plant protection, its application in practice, and legal provisions.	
<b>Course enrolments requirements</b>	None	
<b>Intended course learning outcomes</b>		
<p>Upon successful completion of the module, students will be able to:</p> <ol style="list-style-type: none"> <li>1. Describe the basic principles of the extension service as a professional service in agriculture.</li> <li>2. Distinguish the roles of all competent institutions, companies and individuals important for the realization of competitive agriculture.</li> <li>3. Propose a program of protection measures for arable, vegetable and fruit crops, and professional assistance to producers in the field.</li> <li>4. Independently apply the Plant Protection Act and legal legislation on regulation and distribution of plant protection products</li> <li>5. Identify the risks of residues of plant protection products to food safety.</li> <li>6. Independently apply occupational safety measures with pesticides and prevent environmental contamination.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
<p>To gain the right to take the final exam, students must accumulate a minimum number of assessment points. These points are earned through attendance (with a minimum requirement of 70%), participation in class activities, and performance on partial exams. Additionally, students are required to present a seminar paper orally, lasting 10 to 15 minutes. The evaluation of the seminar paper will consider the clarity, accuracy, and relevance of the written content, along with the overall technical and visual quality of the presentation. The final exam is mandatory, and a passing grade on the exam is essential for achieving a positive final grade. This exam will be conducted in an oral format.</p>		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Website of th Estension Service: <a href="http://www.savjetodavna.hr/">http://www.savjetodavna.hr/</a></li> <li>2. Act on the Sustainable Use of Pesticides (OG 46/22)</li> <li>3. Plant Health Act (OG 127/19, 83/22)</li> <li>4. Plant Protection Bulletin 2023: Overview of Plant Protection Products in Croatia for 2023. (Numbers 1-2.) ISSN 1332-9545</li> </ol>		
<b>Additional literature</b>		
<ol style="list-style-type: none"> <li>1. Ministry of Agriculture 2015: Manual for the safe handling and application of plant protection products. ISBN 978-953-6718-19-1</li> </ol>		

<b>ENTOMOLOGY II</b>		
<b>Coordinator</b>	Ivana Majić	
<b>Collaborators</b>	Ankica Sarajlić	
<b>Year and semester</b>	1st year, 2nd semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L+E+S)	75 (50L+25E)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	Introduce students to the biology and ecology of insects, and aspects of the impact of insects on humans and the environment. The students will learn about the importance of insect biodiversity in agriculture and integrated pest management measures.	
<b>Course enrolments requirements</b>	No requirements	
<b>Intended course learning outcomes</b>		
Upon successful completion of the module, students will be able to:		
<ol style="list-style-type: none"> <li>1. Recognize the symptoms of an attack on plants from pests;</li> <li>2. Describe the biology and ecology of the most important pest species;</li> <li>3. Describe the biology of beneficial insects;</li> <li>4. Identify Invasive insect species;</li> <li>5. Distinguish between beneficial and pest insect species families and genera;</li> <li>6. Apply integrated pest management measures;</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
Students gain the right to take the final exam by accumulating a minimum number of assessment points. These points can be earned through regular attendance (with a minimum of 70%), participation in class activities, and performance on two partial exams. The final exam is mandatory, and obtaining a passing grade is required for achieving a positive final grade. This exam will be conducted in an oral format.		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Ciglar, I. (1998): Integrated protection of orchards and vineyards. Zrinski d.d. Čakovec.</li> <li>2. Ivezić, M. (2003.): Pests of grapevines and fruit trees. Script of the Polytechnic of Požega and the Polytechnic of Rijeka.</li> <li>3. Ivezić, M. (2008.): Entomology – Insects and Other Pests in Agriculture. Grafika d.o.o.</li> <li>4. Ivezić, M. (2014.): Phytonematology. Grafika d.o.o.</li> <li>5. Maceljiski, M., Cvjetković B., Ostojić Z., Barić B.(2006.): Pests of grapevines. Zrinski d.d., Čakovec.</li> <li>6. Maceljiski, M. (2002): Agricultural entomology. Zrinski d.d. Čakovec.</li> <li>7. Maceljiski, M., Cjetković, B., Ostojić, Z., Igrc-Barčić, J., Pagliarini, M., Oštrec, Lj., Barić, K., Čizmić, I. (2004): Vegetable pests, Zrinski, Čakovec</li> </ol>		
<b>Additional literature</b>		
<ol style="list-style-type: none"> <li>1. Gullan, P.J. &amp; Cranson, P.S. (1994): The Insects, An Outline of Entomology. Chapman &amp; Hall(knjiga)</li> <li>2. Odum P.E. (1959): Fundamentals of ecology. W.B Saunders Company, USA</li> <li>3. Pedigo, P. L. (1996): Entomology &amp; pest management. Prentice Hall Upper Saddle River, NJ 07458, USA</li> <li>4. Oštrec, Lj. &amp; Gotlin Čuljak, T. (2005.) General entomology. Zrinski d.d. Čakovec</li> </ol>		

<b>STORAGE OF AGRICULTURAL PRODUCTS</b>		
<b>Coordinator</b>	Vlatka Rozman	
<b>Collaborators</b>	Anita Liška, Pavo Lucić Marija Ravlić	
<b>Year and semester</b>	1st year, 2nd semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L+E+S)	75 (55L+5E+15S)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	To introduce graduate students to the principles of storage of stored products, pests of stored products (insects, mites, rodents), ways of controlling storage pests, and the application of pesticides in storage facilities.	
<b>Course enrolments requirements</b>	None	
<b>Intended course learning outcomes</b>		
<p>Upon successful completion of the module, students will be able to:</p> <ol style="list-style-type: none"> <li>1. Describe the factors that affect the viability of stored products.</li> <li>2. Distinguish between types of warehouses for the storage of grain, root and tuberous plants.</li> <li>3. Group storage pests according to the damage they cause to stored products.</li> <li>4. Propose ways of detecting insects in warehouses of agricultural products.</li> <li>5. Explain the significance of the danger of the presence of rodents in warehouses of agricultural products.</li> <li>6. Distinguish between preventive, curative and integrated measures for the protection of stored agricultural products.</li> <li>7. Know how to avoid the occurrence of resistance of certain pest populations to plant protection products.</li> <li>8. Describe the use of pesticides in storage facilities.</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
Students are expected to continuously attend classes and actively participate in tasks during lectures, seminars and exercises. During the semester, there will be one seminar and three partial, written exams. At the beginning of the semester, students will be introduced to the program of the module and the exact dates of the partial exams. The final exam is written.		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Kalinović, I. (1997): Storage and Technology of Crop Products. Internal script. Faculty of Agriculture, Osijek: 1-129.</li> <li>2. Korunić, Z. (1990): Pests of Stored Agricultural Products, Biology, Ecology and Control. Gospodarski list, Zagreb: 1-220.</li> <li>3. Rozman, V., Liška, A.: Storage of Agricultural Products – Exercise Manual (web edition)</li> <li>4. Rozman, V., Korunić, Z., Liška, A. (2020): Insects – Economic Pests of Stored Agricultural Products and Food and Recognition by Damage. Collection of lectures DDD Continuous education for contractors of mandatory disinfection and disinfestation measures – Comprehensive (integral) control of food pests, stored agricultural products, objects of general use and museum pests. Zagreb, May 26 to June 16, 2020/ Korunić, J. Str: 21-50. ISBN: 978-953-7247-37-9</li> <li>5. Rozman, V., Liška, A. (2020): Methods of detecting harmful insects. Collection of lectures DDD Continuous education for contractors of mandatory disinfection, disinfestation and rodent control measures – Comprehensive (integral) control of food pests, stored agricultural products, objects of general use and museum pests. Zagreb, ed. Korunić, J. Str: 65-73. ISBN: 978-953-7247-37-9</li> </ol>		

6. Rozman V. (2021): Pest resistance to pesticides. Continuous education for contractors of mandatory disinfection, disinsection and rodent control measures and persons in supervision – Basic principles of implementation of DDD measures in practice. Zagreb, ed: Korunić J. Str: 65-68. ISBN: 978-953-7247-39-3.
7. Rozman, V., Korunić, Z., Liška, A. (2022): Pest resistance to phosphine and bioassays. Proceedings of lectures DDD Continuous education for contractors of mandatory disinfection, disinsection and rodent control measures – Dangers during the implementation of disinfection, disinsection, rodent control and fumigation measures. Zagreb, ed: Korunić, J., St:71-74. ISBN: 978-953-7247-41-6
8. Rozman V. (2022): resistance of cockroaches, ants and termites to insecticides and bioassays. Proceedings of lectures DDD Continuous education for contractors of mandatory measures of disinfection, disinsection and rodent control – Comprehensive (integrated) control of cockroaches, crickets, ants and termites. Zagreb, ed: Korunić, J., St:35-38. ISBN: 978-953-7247-42-3

**Additional literature**

1. Ministry of Agriculture (2015): Manual for the safe handling and application of plant protection products. ISBN 978-953-6718-19-1
2. Act on the Sustainable Use of Pesticides (OG 46/22)
3. Plant Health Act (OG 127/19, 83/22)
4. Plant Protection Bulletin (2023): Overview of plant protection products in Croatia for 2023. (Numbers 1-2.) ISSN 1332-9545
5. Korunić J. (2022): Insecticides, fumigants and rodenticides in traffic in the Republic of Croatia, 22nd edition, Zagreb, Korunić d.o.o. ISSN 1846-209X

Plant production (University Graduate Study Programme)  
Major in **PLANT PROTECTION**

<b>WEEDS</b>		
<b>Coordinator</b>	Edita Štefanić	
<b>Collaborators</b>	Sanda Rašić	
<b>Year and semester</b>	1st year, 2nd semester	
<b>Number of credits and mode of delivery</b>	ECTS credits	6
	Number of hours (L + E+F)	75 (45P+20E+10F)
<b>COURSE DESCRIPTION</b>		
<b>Course aims</b>	To introduce students to the biological and ecological characteristics of weeds, the damage they cause in agricultural production and control measures (chemical, mechanical, biological).	
<b>Course enrolments requirements</b>	No requirements	
<b>Intended course learning outcomes</b>		
Upon successful completion of the module, students will be able to:		
<ol style="list-style-type: none"> <li>1. Describe and clarify the term "weed"</li> <li>2. Explain the division of herbicides and the mechanism of action</li> <li>3. Create a weed control program for individual crops</li> <li>4. Calculate and present the most effective weed control strategy for a particular crop</li> <li>5. To distinguish and compare the most important weed plants</li> <li>6. Apply the appropriate weed mapping technique</li> </ol>		
<b>Assessment and evaluation of student work during classes</b>		
Students can access the final exam by accumulating the minimum required grade points. These points are awarded based on attendance (at least 70%), active participation in class activities, and performance in two partial examinations held during the semester. Additionally, students are required to independently collect plants for the herbarium. The final exam is mandatory, and passing this exam is a prerequisite for participating in the oral exam focused on the herbarium.		
<b>Obligatory literature</b>		
<ol style="list-style-type: none"> <li>1. Štefanić, E. (2019) Sustainable Weed Management. J.J. Strossmayer University of Osijek, Faculty of Agrobiotechnical Sciences.</li> <li>2. Anderson, W.P. (1989): Weed Science: Principles and Application. West Publishing Company, New York</li> <li>3. Štefanić, E.: Moodle (FAZOS_WS): lectures</li> </ol>		
<b>Additional literature</b>		
<ol style="list-style-type: none"> <li>1. Hulina, N (1998): Weeds. Školska knjiga, Zagreb.</li> <li>2. Plant Protection Bulletin: Overview of Plant Protection Products in Croatia</li> </ol>		