UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Bioprocesna tehnika
Course title:	Bioprocess techniques

Študijski programi in stopnja	Študijska smer	Letnik	Semestri
Bioznanosti, tretja stopnja, doktorski	Ni členitve (študijski program)		Celoletni

Univerzitetna koda predmeta/University course code: 3831

Predavanja	Seminar	Vaje	Klinične vaje	Druge oblike študija	Samostojno delo	ECTS
10	20	0	0	0	95	5

Nosilec predmeta/Lecturer: Iztok Golobič

Vrsta predmeta/Course type: teoretični/theoretical

Jeziki/Languages:		
	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Splošni pogoji za vpis na doktorski študij	General conditions for enrolment in doctoral studies.

Vsebina:	**Content (Syllabus outline):**
V uvodnem delu je predstavljena procesna tehnika v okviru termičnega, mehanskega, bio-, kemijskega in okoljskega segmenta procesne tehnike. Termodinamične osnove ločevalnih procesov temeljijo na prestavitvi zmesi in raztopin, parno-kapljevitega ravnotežja, Gibbsovega pravila faz, binarnih sistemov, Raultovega zakona idealnih raztopin, Henrijevega zakona ter predstavitve onovnih značilnosti ternarnih sistemov in azeotropnih zmesi. V okviru Prenosa snovi bo izhodišče Fickov zakon, difuzija, konvektivni prenos snovi ter numerične metode reševanja problemov prenosa snovi. Sledijo osnovni procesi procesne tehnike: uparjanje, destilacija, rektifikacija, sorpcijski procesi, kristalizacija in sušenje z podrobnejšo obravnavo vlažnega zraka, h - x diagrama in eksergijskega diagrama vlažnega zraka, večstopenjskega sušenja, vrste sušilnikov in izbira sušilnega procesa v odvisnosti od vrste blaga v farmacevtski, prehrambeni in procesni industriji, liofilizacija. Sledijo mešanje, membranske tehnologije, mikro, ultra in nanofiltracija, reverzna osmoza in ionska izmenjava. V okviru bioreaktorjev bodo obravnavane vrste in njihova uporaba ter vodenje in nadzor procesov.	In the introductory chapter, process technology is presented within the framework of thermal, mechanical, biochemical, chemical and environmental segments of process engineering. Thermodynamic fundamentals of separation processes based on presentation of mixtures and solutions, vapor-liquid equilibrium, Gibbs free energy, binary systems, Rault's law of ideal solutions, Henri's law and fundamental characteristics of ternary systems and azeotropic mixtures. Within the framework of mass transfer, the starting points are Fick's law, diffusion, convective mass transfer and numerical methods of solving problems of mass transfer. These are followed by the basic processes of process technology: evaporation, distillation, rectification, sorbic processes, crystallization and drying with detailed consideration of moist air, h-x diagram and exergy diagram of moist air, multi-level drying, types of dryers and selection of the drying process depending on the type of goods in the pharmaceutical, food and process industries, liofilisation. Mixing, membrane technologies, micro-, ultra- and nanofiltration, reversible osmosis and ionic exchange follow. Within the framework of bioreactors the types and their application are considered, together with process management and control.

Temeljna literatura in viri/Readings:

- Seader J.D., Henley E.J, Separation Process Principles, John Wiley and Sons, 2nd Edition, New York, 2006.
- Basmadjian D., Mass Transfer and Separation Processes, CRC Press, Boca Raton, 2007.
- Vogel, G.H., Process Development, Wiley-VCH, Weinheim, 2005.
- Schwister, K., Taschenbuch der Verfahrenstechnik, Fachbuchverlag, Leipzig, 2000.
- Mersmann, A., Kind M., Slichlmair, J., Thermische Verfahrenstechnik, Grundlagen und Methoden, München, 2005.

Cilji in kompetence:	**Objectives and competences:**
Cilj predmeta je seznaniti študenta z osnovami bioprocesne tehnike in ga usposobiti za uporabo inženirskih orodij ob hkratnem utrjevanju inženirskega pristopa k reševanju problemov bioprocesne tehnike. Seznanijo se z osnovnimi snovnimi operacijami, ki temeljijo na snovnih in energijskih tokovih ter fazno ravnotežnih fenomenih. Spoznajo principe in osvojijo metode za delo na področju uporabe metod, sistemov in procesov priprave, ločevanja in čiščenja nečistih snovi s ciljem dobiti čiste produkte.	The course aims to acquaint students with the fundamentals of bioprocess technology and qualify them for application of engineering tools, while revising the engineering approach in order to solve problems from bioprocess technology. Students are familiarised with basic matter operations, based on mass and energy flows and phase equilibrium phenomena. They are familiarised with principles and methods for working in the field of application of methods, systems and processes of preparation, separation and purification of impure substances in order to obtain pure products. The subject develops the ability to apply engineering, technical, mathematical and scientific tools for solving engineering problems in nature.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Predmet razvija sposobnost uporabe inženirskih, tehničnih, matematičnih in znanstvenih orodij za reševanje inženirskih problemov v naravi. Osvojene kompetence predstavljajo gradnik usposobljenosti biti vodja in biti vodilni člen razvojno raziskovalne dejavnosti v kreativnem, komunikativnem timskem delu na področju biotehnike. Predmetno specifične kompetence gradijo usposobljenost slušatelja za prepoznavanja problemov in inženirskega pristopa k reševanju problemov ob hkratnem upoštevanju inženirskega kodeksa ter profesionalne, etične in okoljske odgovornosti.	The acquired competences qualify the participants to be leaders and leading members of the development-research sector in creative, communicative team work in the field of biotechnology. The competences specific to the subject qualify the participants to identify the problems and engineering approach to solve problems while considering engineering codes and professional, ethical and environmental responsibility.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, seminarji, konzultacije.	Lectures, seminars, consultations.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Seminar in ustni zagovor seminarja.	100,00 %	Seminar and oral presentation of seminar.

Reference nosilca/Lecturer's references:

Prof. dr. Iztok Golobič

1. SITAR, Anže, MOŽE, Matic, CRIVELLARI, Michele, SCHILLE, Jörg, GOLOBIČ, Iztok. Nucleate pool boiling heat transfer on etched and laser structured silicon surfaces. *International journal of heat and mass transfer*. 2020, vol. 147, str. 1-12.

2. MOŽE, Matic, ZUPANČIČ, Matevž, HOČEVAR, Matej, GOLOBIČ, Iztok, GREGORČIČ, Peter. Surface chemistry and morphology transition induced by critical heat flux incipience on laser-textured copper surfaces. *Applied Surface Science*. 2019, str. 1-43.

3. VOGLAR, Jure, ZUPANČIČ, Matevž, PEPERKO, Aljoša, BIRBARAH, Patrick, MILJKOVIC, Nenad, GOLOBIČ, Iztok. Analysis of heater-wall temperature distributions during the saturated pool boiling of water. *Experimental thermal and fluid science*. 2019, vol. 102, str. 205-214.

4. ZAKŠEK, Peter, ZUPANČIČ, Matevž, GREGORČIČ, Peter, GOLOBIČ, Iztok. Investigation of nucleate pool boiling of saturated pure liquids and ethanol-water mixtures on smooth and laser-textured surfaces. *Nanoscale and microscale thermophysical engineering*. 2019, str. 1-14.
5. SITAR, Anže, ŠKRLEC, Klemen, VOGLAR, Jure, AVANZO, Matej, KOČEVAR, Klemen, CEGNAR, Mateja, IRMAN, Špela, RAVNIK, Jure, HRIBERŠEK, Matjaž, GOLOBIČ, Iztok. Effects of controlled nucleation on freeze-drying lactose and mannitol aqueous solutions. *Drying technology*. 2018, vol. 36, str. 1263-1272.
6. VOGLAR, Jure, GREGORČIČ, Peter, ZUPANČIČ, Matevž, GOLOBIČ, Iztok. Boiling performance on surfaces with capillary-length-spaced one- and two-dimensional laser-textured patterns. *International journal of heat and mass transfer*. 2018, vol. 127, part a, str. 1188-1196.
7. RAVNIK, Jure, GOLOBIČ, Iztok, SITAR, Anže, AVANZO, M., IRMAN, Špela, KOČEVAR, K., CEGNAR, Mateja, ZADRAVEC, Matej, RAMŠAK, Matjaž, HRIBERŠEK, Matjaž. Lyophilization model of mannitol water solution in a laboratory scale lyophilizer. *Journal of drug delivery science and technology*. 2018, vol. 45, str. 28-38.
8. GREGORČIČ, Peter, ZUPANČIČ, Matevž, GOLOBIČ, Iztok. Scalable surface microstructuring by a fiber laser for controlled nucleate boiling performance of high- and low-surface-tension fluids. *Scientific reports*. 2018, vol. 8, f. 1-8. https://www.nature.com/articles/s41598-018-25843-5.pdf.
9. STEINBÜCHER, Miha, VENTURINI, Peter, HAFNER, Jože, ZUPANČIČ, Matevž, GREGORČIČ, Peter, GOLOBIČ, Iztok. The impact of a silane pigment treatment on the properties of thickness-sensitive spectrally selective paints. *Acta chimica slovenica*. 2017, vol. 64, str. 938-944.

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Inoviranje proizvodov
Course title:	Product innovation

Študijski programi in stopnja	Študijska smer	Letnik	Semestri
Bioznanosti, tretja stopnja, doktorski	Ni členitve (študijski program)		Celoletni

Univerzitetna koda predmeta/University course code: 3832

Predavanja	Seminar	Vaje	Klinične vaje	Druge oblike študija	Samostojno delo	ECTS
10	15	5	0	0	95	5

Nosilec predmeta/Lecturer: Roman Žavbi

Vrsta predmeta/Course type: teoretični/theoretical

Jeziki/Languages:		
	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij	General conditions for enrolment in doctoral studies

Vsebina:	Content (Syllabus outline):
Tehnični sistem za zadostitev določenega procesa. Inovacije in inoviranje. Struktura izdelka. Nivoji konstruiranja. Povezava trga, uporabnika z proizvajalcem. Pregled procesa in podprocesov. Funkcijska struktura izdelka. Inovacija procesa in proces vstopa v proizvodni sistem. Inovacija izdelka in vstop s spremembo v proizvodni sistem. Značilni tipi proizvodnje in kako vstopamo s spremembo v posamezen tip proizvodnje. Ocena inovacije: ekonomska, zakonodajna, tehnična, trajnostni razvoj in marketinška. Predstavitev inovacije: v proizvodnem sistemu, uporabnikom in celotnemu okolju. Modeli predstavitve. Seminarske naloge: Pregled obstoječih izdelkov. Kritična analiza s strani snovalca izdelka in/ali uporabnika. Postavitev funkcijske strukture izdelka in nastavitev poteka uvajanje spremembe. Zasnova novega procesa, po principu »nora ideja«. Analiza procesnih stanj. Postavitev funkcijske strukture izdelka. Koncipiranje izdelka in izdelava ocene. Pregled obstoječega izdelka. Izdelava ocene izdelka: ekonomska, zakonodajna, tehnična, trajnostni razvoj in marketinška. Opredelitev potrebnih aktivnosti. Postavitev modela uvajanja inovacije v neposredno proizvodno okolje. Laboratorijske vaje: uporaba računalniških orodij v procesu iskanja priložnosti za nov izdelek.	Technical system for a specific process. Innovations and innovating. Product structure. Levels of design. Links between the market, customer and manufacturer. Process and sub-processes survey. Functional structure of a product. Product innovation and introducing change into a production system. Typical types of production and ways of initiating a specific type of production by means of change. Innovation assessment from the economic, legislative, technical, sustainable development and marketing points of view. Presenting an innovation: in the production system, to customers and the whole environment. Presentation models. Seminar work: Survey of existing products. Critical analysis by product designer and/or user. Presentation of product's functional structure and setting a schedule for the introduction of changes. Concept of a new process, following the »crazy idea« principle. Analysis of process conditions. Setting up the functional structure of a product. Conceiving a product and making an assessment. Survey of an existing product. Making a final product assessment from economic, legislative, technical, sustainable development and marketing points of view. Defining the necessary activities. Setting up a model for introducing the innovation directly into the manufacturing environment. Laboratory work: application of computer tools in the process of seeking new product opportunities.

Temeljna literatura in viri/Readings:

- Leifer, R. Radical innovation : how mature companies can outsmart upstarts, Boston, Mass. : Harvard Business School Press, 2000
- Christensen, C. M. The innovator's dilemma: the revolutionary book that will change the way you do business, 1st HarperBusiness Essentials ed. New York : HarperBusiness Essentials, 2003
- Christensen, C. M., Raynor, M. E. The innovator's solution : creating and sustaining successful growth: Boston (Mass.) : Harvard Business School Press, 2003
- Hubka, V., Eder, W.E., 1988. Theory of Technical Systems: A Total Concept Theory for Engineering Design, Berlin Heidelberg: Springer-Verlag.
- Ulrich, K.T., Eppinger, S.D. (2011). Product Design and Development, Fifth Edition. Boston: McGrawHill.
- Pretnar, B. Intelektualna lastnina v sodobni konkurenci in poslovanju : pravne osnove, ekonomska analiza in podjetniški cilji, Ljubljana: GV založba, 2002

Cilji in kompetence:	**Objectives and competences:**
Osnovni namen predmeta je osvojiti ključna znanja iz področja razvoja inovativnih izdelkov (t.j. tehničnih sistemov). Poudarek je na sistematičnem pristopu, ki je opredmeten v metodi iskanja priložnosti za nove izdelke ter izvedbi metode v mešanih industrijsko-akademskih timih.	The main aim of the course is to acquire key knowledge in the area of innovative product development (i.e. technical systems). The emphasis is on a systematic approach, substantiated in the method for seeking new product opportunities, and on the application of methods in joint industrial/academic teams.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Slušatelj je po zaključku predmeta usposobljen za samostojno in multidisciplinarno timsko delo na področju iskanja priložnosti za inovativne izdelke, pri čemer upošteva konkretno podjetje, socialne, ekonomske, tehnološke in zakonodajne dejavnike. Usposobljen je za uporabo programskih orodij, ki podpirajo razvoj inovativnih izdelkov.	After the course, students will be competent for individual and multidisciplinary team work in the area of seeking innovative product opportunities, taking account of real business, social, economic, technological and legislative factors. They will be competent independently to use programme tools that support the development of innovative products.

Metode poučevanja in učenja:	**Learning and teaching methods:**
V primeru manjšega števila študentov pod 5 bo študij izveden po predloženi literaturi in s konzultacijami. Običajno pa s predavanji, vajami in laboratorijskimi vajami za pripravo seminarskih nalog	In case of less than 5 students, the course will be carried out in the form of consultations and with the use of the provided literature. Regular course will include lectures, tutorials and laboratory work for the preparation of seminar works.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Kandidat lahko pristopi k ustnemu izpitu po predložitvi pozitivno ocenjene seminarske naloge.	100,00 %	A candidate can sit for an oral examination after submitting a favourable assessment of the seminar work.

Reference nosilca/Lecturer's references:

Roman Žavbi

1. ŽAVBI, Roman, FAIN, Nuša, RIHTARŠIČ, Janez. Evaluation of a method and a computer tool for generating concept designs. *Journal of engineering design*, ISSN 0954-4828. [Print ed.], 2013, vol. 24, iss. 4, str. 257-271, doi: 10.1080/09544828.2012.721539. [COBISS.SI-ID 12446235]

2. BENEDIČIČ, Janez, ŽAVBI, Roman, DUHOVNIK, Jože. Systematic development of a device for bituminous layer application. *Strojniški vestnik*, ISSN 0039-2480, Dec. 2013, vol. 59, no. 12, str. 725-734, ilustr., doi: 10.5545/sv-jme.2013.1154. [COBISS.SI-ID 13278747]

3. RIHTARŠIČ, Janez, ŽAVBI, Roman, DUHOVNIK, Jože. Application of wirk elements for the synthesis of alternative conceptual solutions. *Research in engineering design*, 2012, vol. 23, iss. 3, str. 219-234, ilustr., doi: 10.1007/s00163-012-0127-z. [COBISS.SI-ID 12179483]

4. BENEDIČIČ, Janez, DUHOVNIK, Jože, ŽAVBI, Roman. Innovations for future development of farms : a case study of the implementation of an opportunity search method on a farm. *Transactions of the ASABE*, ISSN 2151-0032, 2011, vol. 54, no. 2, str. 743-752. [COBISS.SI-ID 11815451]
5. ŽAVBI, Roman, BENEDIČIČ, Janez, DUHOVNIK, Jože. Use of mixed academic-industrial teams for new product development : delivering educational and industrial value. *The international journal of engineering education*, ISSN 0949-149X, 2010, vol. 26, no. 1, str. 178-194, ilustr. [COBISS.SI-ID 11323675]
6. ŽAVBI, Roman, RIHTARŠIČ, Janez. Synthesis of elementary product concepts based on knowledge twisting. *Research in engineering design*, 2010, vol. 21, no. 2, str. 69-85, doi: 10.1007/s00163-009-0076-3. [COBISS.SI-ID 11043099]

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Kriteriji varnosti
Course title:	Safety criteria

Študijski programi in stopnja	Študijska smer	Letnik	Semestri
Bioznanosti, tretja stopnja, doktorski	Ni členitve (študijski program)		Celoletni

Univerzitetna koda predmeta/University course code: 3833

Predavanja	Seminar	Vaje	Klinične vaje	Druge oblike študija	Samostojno delo	ECTS
10	25	0	0	10	80	5

Nosilec predmeta/Lecturer: Boris Jerman

Vrsta predmeta/Course type: teoretični/theoretical

Jeziki/Languages:		
	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij.	General conditions for enrolment in doctoral studies.

Vsebina:	Content (Syllabus outline):
V okviru predmeta bo podrobno pojasnjen koncept zagotavljana varnosti in zdravja pri delu, kar vključuje tudi komponente varovanja okolja. Opisani bodo parametri, ki vplivajo na zagotavljanje varnosti. Razložena bosta koncepta vgrajene in dodana varnost. Definiran bo pojem tveganje in obrazloženi njegovi elementi. Predstavljene bodo tipične nevarnosti, ki se lahko pojavijo pri delu s stroji. Obravnavane bodo varnostne analize, s pomočjo katerih se določajo nivoji tveganja. Slušatelji bodo spoznali varnostne naprave in sisteme, vključno z osnovnimi varnostnimi krmilji, ki se uporabljajo pri zagotavljanju ustrezne varnosti. Predstavljen bo pomen pravilne prostorske postavitve strojev in naprav ter posebnosti pri mobilnih strojih. Vključen bo tudi vpliv pogojev okolice na varnost pri delu s stroji (osvetljenost, hrup, temperatura, vlažnost, prah, hitrost gibanja zraka, itd.). Predstavljeni bodo tudi postopki zagotavljanja varnosti pri ročnih orodjih in strojih ter pri stacionarnih in mobilnih strojih, s poudarkom na kmetijskih, gozdarskih, lesarskih in živilsko-predelovalnih strojih. Obravnavane bodo tudi sledeče teme: metode pregledovanja in preizkušanja strojev in naprav, vpliv organizacije dela na varnost, vpliv novih tehnologij na zagotavljanje varnosti, upravljanje s tveganji. Predstavljeni bodo tudi relevantni predpisi in standardi ter primeri iz prakse. V predmet bo vključeno tudi raziskovalno delo.	The main framework of the course is the concepts of safety and health assurance at work and of environmental protection. Influential parameters will be presented and described. The concepts of built-in and add-on safety will be introduced. The concept of risk will be defined and its elements will be described in detail. Typical hazards that can be present during work with machinery will be described. Safety analysis for determining the levels of risk will be treated. Safety devices and systems, including basic safety circuits used for safety assurance will be introduced to the students. The importance of the correct positioning of machines in the workshop will also be introduced, together with the particularities of mobile machines. The influence of environmental conditions (light, noise, temperature, humidity, dust, airflow speed, etc.) on the safety of work with machinery will also be taken into account. Safety measures concerning work with hand-held machines will also be introduced, as will be stationary and movable machines with an emphasis on agricultural, forestry, wood-working, and food-processing machines. The following topics will also be included: methods for testing and inspecting machinery, the impact of work arrangements on safety at work, the influence of new technologies on safety assurance, risk management. The relevant regulations and standards will be introduced, together with practical examples. Research work will also be included.

Temeljna literatura in viri/Readings:

- Ridly J, Pearce D. Safety with Machinery. Oxford [etc.]: Butterworth-Heinemann,2005;
- Macdonald DM. Practical machinery safety. Oxford: Newnes: Burlington, 2004;
- Roger LB. Safety and Health for Engineers. New Jersy: John Wiley & Sons, 2006;
- Jerry RD, Robert HW, Mark AP, Dennis JM. Agricultural Safety & Health for Engineers. Asae Publication: 1994;
- revijalni članki s področja/journal articles;
- tekoča periodika/current periodics;
- druga učna gradiva/other teaching readings.

Cilji in kompetence:	**Objectives and competences:**
Izobraževalni cilji*:* Cilji predmeta so posredovati slušatelju ustrezna znanja, potrebna za razumevanje koncepta zagotavljanja varnosti. Naučiti se mora prepoznavati nevarnosti in škodljivosti ter oceniti tveganja, ki jih te nevarnosti in škodljivosti predstavljajo tako za delavca, kot tudi za okolico. Znati mora oceniti obstoječe varnostno stanje in določiti ustrezne morebitno potrebne varnostne ukrepe. Poudarek je na varnosti tehniških sistemov v biotehniki. Študijski rezultati: Slušatelj je po uspešno zaključenem predmetu seznanjen z ustreznimi varnostnimi kriterije in jih zna samostojno uporabljati. Pozna elemente tveganja in metode za zniževanje tveganja. Usposobljen je to znanje uporabiti pri zagotavljanju varnosti stroja tako med njegovim projektiranjem, kakor tudi sodelovati pri izdelavi navodil za uporabo takega stroja in pri razvijanju varnih postopkov dela. Slušatelj se zaveda nujnosti zagotavljanja varnostni na najučinkovitejši a hkrati razumen in tudi ekonomsko upravičen način. Zaveda se pomena zagotavljanja varnosti in varovanja zdravja pri delu, kakor tudi pomena varovanja okolja.	The aim of the course is to give students the appropriate knowledge required for understanding the concept of ensuring technical safety. The students must learn how to recognize hazards and potential injury and to assess the risk which these hazards represent to workers and the environment. The students must be able to assess existing safety conditions and to determine adequate safety measures, if required. The stress is placed on the safety of biotechnical systems. After successful conclusion of the course, the student is familiar with relevant safety criteria and he/she is capable of autonomous use of these criteria. He/she is familiar with the elements of risk and with methods of risk reduction. He/she is qualified for practical application of this knowledge for ensuring the safety of a machine during all phases of its “life”, including participation in the construction phase, in writing the instructions for use, and in the development of procedures for safe work. The student is aware of the need for meeting safety requirements in the most effective but also reasonable way, also bearing in mind the economic point of view. He/she is aware of the importance of safety and health assurance at work, as well as protection of the environment.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje:	Knowledge and understanding:

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja (učilnica), seminarji (individualno), konzultacije (individualno) in raziskovalno delo (individualno).	Lectures (classroom), seminars (individual work), consultations (individual work) and research (individual work).

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Lectures (classroom), seminars (individual work),	70,00 %	Individual project – preparation,
consultations (individual work) and research (individual work)	30,00 %	presentation and oral defence

Reference nosilca/Lecturer's references:

doc. dr. Boris Jerman

1. HLADNIK, Jurij, RESMAN, Franc, JERMAN, Boris. Torsion stiffness of a racing cross-country ski boot. *Proceedings of the Institution of Mechanical Engineers. Part P, Journal of sports engineering and technology (Print)*, ISSN 1754-

3371, 2013, doi: 10.1177/1754337113485349. [COBISS.SI-ID 12936475], [JCR, WoS do 25. 11. 2013: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0, Scopus do 21. 3. 2014: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0]

2. VUJIČIĆ, Andrija, ZRNIĆ, Nenad Đ., JERMAN, Boris. Ports sustainability : a life cycle assessment of zero emission cargo handling equipment. *Strojniški vestnik*, ISSN 0039-2480, Sep. 2013, vol. 59, no. 9, str. 547-555, ilustr., doi: 10.5545/sv-jme.2012.933. [COBISS.SI-ID 13112859], [JCR, SNIP, WoS do 21. 10. 2013: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0, Scopus do 30. 9. 2013: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0]

3. JERMAN, Boris, HRIBAR, Anton. Dynamics of the mathematical pendulum suspended from a moving mass. *Tehnički vjesnik*, ISSN 1330-3651, 2013, vol. 20, no. 1, str. 59-64, ilustr. http://hrcak.srce.hr/index.php?show=clanak&id_clanak_jezik=143490. [COBISS.SI-ID 12724251], [JCR, SNIP, WoS do 24. 3. 2014: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0, Scopus do 12. 3. 2013: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0]

4. BOŠNJAK, Srđan, PETKOVIĆ, Zoran, GNJATOVIĆ B., Nebojša, MILENOVIĆ LJ., Ivan, JERMAN, Boris. Impact of the track wheel axles on the strength of the bucket wheel excavator two-wheel bogie. *Tehnički vjesnik*, ISSN 1330-3651, 2013, god. 20, br. 5, str. 803-810, ilustr. [COBISS.SI-ID 13212443], [JCR, SNIP, WoS do 24. 3. 2014: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0, Scopus do 24. 3. 2014: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0]

5. LANGERHOLC, Marko, ZRNIĆ, Nenad Đ., ĐORĐEVIĆ, Miloš, JERMAN, Boris. Conveyor design optimization as the provision of sustainability. *Tehnički vjesnik*, ISSN 1330-3651, 2013, god. 20, br. 5, str. 837-846, ilustr. [COBISS.SI-ID 13212699], [JCR, SNIP, WoS do 24. 3. 2014: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0, Scopus do 24. 3. 2014: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0]

6. MARINOVIĆ, Ivica, SPREČIĆ, Denijal, JERMAN, Boris. A slewing crane payload dynamics. *Tehnički vjesnik*, ISSN 1330-3651, Dec. 2012, vol. 19, no. 4, str. 907-916, ilustr. http://hrcak.srce.hr/index.php?show=clanak&id_clanak_jezik=137730. [COBISS.SI-ID 12699931], [JCR, SNIP, WoS do 24. 3. 2014: št. citatov (TC): 1, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0, Scopus do 13. 3. 2013: št. citatov (TC): 1, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0]

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Meritve v kmetijstvu
Course title:	Measurement in agriculture

Študijski programi in stopnja	Študijska smer	Letnik	Semestri
Bioznanosti, tretja stopnja, doktorski	Ni členitve (študijski program)		Celoletni

Univerzitetna koda predmeta/University course code: 3834

Predavanja	Seminar	Vaje	Klinične vaje	Druge oblike študija	Samostojno delo	ECTS
10	0	0	0	30	85	5

Nosilec predmeta/Lecturer: Jože Kutin

Vrsta predmeta/Course type: teoretični/theoretical

Jeziki/Languages:

Predavanja/Lectures:	Angleščina, Slovenščina
Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij	General conditions for enrolment in doctoral studies.

Vsebina:	Content (Syllabus outline):
• Uvod v eksperimentalno raziskovalno delo: osnovni koraki v procesu eksperimentiranja; vplivni dejavniki na eksperimentalni proces. • Osnove statističnega načrtovanja poskusov: Klasični in statistično načrtovani poskus; Temeljni koncepti načrtovanja poskusov; Posebnosti in omejitve faktorsko načrtovanih poskusov. • Merilni proces kot vir eksperimentalnih informacij: vplivni dejavniki; temeljni meroslovni pojmi; organiziranost meroslovne infrastrukture; zagotavljanje meroslovne sledljivosti. • Merilni signal kot nosilec informacij o merjeni veličini: Analogni in digitalni, periodični in aperiodični, deterministični in naključni merilni signali; Motnje v merilnih signalih; Zajemanje in pretvorba merilnih signalov. • Merilna zaznavala za električno merjenje mehanskih veličin: Glavne vrste merilnih zaznaval in njihove meroslovne, statične in dinamične značilnosti ter omejitve (piezoelektrična, piezouporovna, termoelektrična, uporovna, magnetouporovna, induktivna, potenciometrična, optična, ultrazvočna, Hallova merilna zaznavala). • Neposredne in posredne metode za merjenje: Mehanske napetosti, sil, navorov, momentov in deformacij; Premikov in razdalj; Kota zasuka in mehanske moči; Mehanskih nihanj in pospeškov;	• introduction to experimental research work: basic steps in process of experimentation; influence factors on experimental process • basics of statistical design of experiments: classic and statistically designed experiments; basic concepts of experimental design; particularities and limitations of factorial designed experiments. • measurement process as source of experimental information: influence factors; basic metrological terms; organization of metrological infrastructure; assurance of metrological traceability • measurement signal as a carrier of information about measurand: analog and digital, periodic and aperiodic, deterministic and random measurement signals; noise in measurement signals; acquisition and conversion of measurement signals. • sensors for electrical measurements of mechanical quantities: main types of sensors and their metrological, static and dynamic characteristics and limitations (piezoelectric, piezoresistant, thermoelectric, resistant, magnetoresistant, inductive, potentiometric, optical, ultrasonic, Hall sensors). • direct and indirect methods for measurements of: mechanical stress, forces, moments and deformations; displacements and distance; rotation angle and mechanical power; mechanical vibrations

Vrtilne hitrosti in frekvence. Tlaka; Temperature. Hitrosti in pretoka tekočin. • Uporaba programske opreme v eksperimentalnem delu: Osnove digitalne obdelave merilnih signalov; Virtualna instrumentacija in druga programska oprema; Validacija programske opreme. • Meroslovno ovrednotenje merilnega sistema in eksperimentalnega procesa: Analiza merilne negotovosti (standardna, sestavljena in razširjena merilna negotovost); Ovrednotenje in prikaz merilnih rezultatov. • Seminarske vaje: Timsko delo na področju načrtovanja eksperimentov, razvoja in validacije različnih merilnih sistemov za mehanske veličine ter vrednotenja merilnih rezultatov. • Laboratorijske vaje: Načrtovanje eksperimentov in merilnih sistemov, eksperimentalni praktikum na izbranih primerih merjenj in poskusov.	and acceleration; rotational speed and frequency; pressure; temperature; fluid velocity and flow rate. • application of software in experimental work: basics of digital processing of measurement signals; virtual instrumentation and other software; validation of software. • metrological evaluation of measurement system and experimental process: analysis of measurement uncertainty (standard, combined and expanded measurement uncertainty); evaluation and presentation of measurement results. • Seminar: team work related to design of experiments, development and validation of various measurement systems for mechanical quantities, and evaluation of measurement results. • Laboratory practice: design of experiments and measurement systems, experimental practice focused on selected measurements and experiments.

Temeljna literatura in viri/Readings:

- Doebelin, E. O.: Engineering experimentation – Planning, execution, reporting. McGraw-Hill, New York, 1995.
- Montgomery, D. C.: Design and analysis of experiments. John Wiley & Sons, New York, 2001.
- Bentley, J. P.: Principles of measurement systems. Pearson Education, Harlow, 2005.
- Busch-Vishniac, I. J.: Electromechanical sensors and actuators. Springer, 1999.
- JCGM 200:2012 – International vocabulary of metrology – Basic and general concepts and associated terms.
- JCGM 100:2008 – Evaluation of measurement data – Guide to the expression of uncertainty in measurement.

Cilji in kompetence:	**Objectives and competences:**
Temeljni cilji učnega predmeta je seznaniti in naučiti študente: s temeljnimi koncepti načrtovanja poskusov ter z meroslovno analizo in ovrednotenjem rezultatov eksperimentalnega dela, s fizikalno-teoretičnimi izhodišči sodobnih merilnih tehnologij, z zajemanjem, obdelavo in prikazom merjenih veličin, z merjenjem temeljnih mehanskih veličin, ki so posebej značilne za kmetijsko tehniko in mehanizacijo, z uveljavljenimi merilnimi metodami, z osnovami virtualne instrumentacije in digitalne obdelave signalov.	The fundamental goal of the course is to familiarise students: with basic concepts of design of experiments and metrological analysis and evaluation of results of experimental work, with physical and theoretical background of modern measurement technologies, with acquisition, processing and display of measurement quantities, with measurement of basic mechanical quantities that are common for agricultural engineering and mechanization, with well-known measurement methods, with fundamentals of virtual instrumentation and digital signal processing.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Pridobljena znanja v študijskem procesu bodo zagotavljala, da bo študent sposoben samostojno: načrtovati eksperimentalni proces; izbrati ustrezno merilno opremo in konfigurirati merilni sistem; uporabljati različne standardizirane ter v praksi uveljavljene merilne metode; izmeriti temeljne mehanske veličine, ki so značilne za kmetijsko tehniko in mehanizacijo; meroslovno ovrednotiti eksperimentalno dobljene rezultate.	With the acquired knowledge during the course, the student will be able to autonomously deal with the following topics: design of experimental process; selection of appropriate measurement equipment and configuration of measurement systems; use of different standardized or other well established measurement methods; perform measurements of basic mechanical quantities that are common for agricultural engineering and mechanization; metrological evaluation of experimentally obtained results.

Metode poučevanja in učenja:	**Learning and teaching methods:**

Predavanja, ki vključujejo reševanje in razpravo o izbranih teoretičnih ter praktično uporabnih primerih. Interaktivna predavanja, skupinsko delo, virtualni eksperimenti.	Lectures, including solving and discussion on selected theoretical and practical cases. Interactive lectures, team work, virtual experiments.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Pogoj za pristop k opravljanju izpita je pozitivna ocena iz seminarskih in laboratorijskih vaj. Izpiti so pisni in ustni.	100,00 %	The basic condition for attending the examination is a positive mark in seminar and laboratory practice. Examinations are written and oral.

Reference nosilca/Lecturer's references:

Jože Kutin

KUTIN, Jože, BOBOVNIK, Gregor, BAJSIČ, Ivan. Dynamic effects in a clearance-sealed piston prover for gas flow measurements. Metrologia, 2011, vol. 48, no. 3, str. 123-132.

KUTIN, Jože, BOBOVNIK, Gregor, BAJSIĆ, Ivan. Heat exchange effects on the performance of a clearance-sealed piston prover for gas flow measurements. Metrologia 52 (2015) 857–863.

BOBOVNIK, Gregor, KUTIN, Jože, BAJSIČ, Ivan. Uncertainty analysis of gas flow measurements using clearance-sealed piston provers in the range from 0.0012 g/min to 60 g/min. Metrologia 53 (2016) 1061-1068.

RUPNIK, Klemen, KUTIN, Jože, BAJSIĆ, Ivan. Identification and prediction of the dynamic properties of resistance temperature sensors. Sensors and Actuators. A, Physical 197 (2013) 69-75.

SVETE, Andrej, BAJSIČ, Ivan, KUTIN, Jože. Investigation of polytropic corrections for the piston-in-cylinder primary standard used in dynamic calibrations of pressure sensors. Sensors and actuators. A, Physical, May 2018, vol. 274, str. 262-271

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Procesi in mehanizacija
Course title:	Processes and mechanisation

Študijski programi in stopnja	Študijska smer	Letnik	Semestri
Bioznanosti, tretja stopnja, doktorski	Ni členitve (študijski program)		Celoletni

Univerzitetna koda predmeta/University course code: 3835

Predavanja	Seminar	Vaje	Klinične vaje	Druge oblike študija	Samostojno delo	ECTS
20	20	0	0	20	190	10

Nosilec predmeta/Lecturer: Leon Kos

Vrsta predmeta/Course type: teoretični/theoretical

Jeziki/Languages:

Predavanja/Lectures:	Angleščina, Slovenščina
Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij	General conditions for enrolment in doctoral studies.

Vsebina:	Content (Syllabus outline):
Procesi v naravi. Preslikava procesov v funkcije. Razdelitev procesov v podprocese in podfunkcije sistemov. Tehnični sistemi in njihova struktura. Koncipiranje tehničnih sistemov in podsistemov. Izpeljava mehanskih, električnih, toplotnih in optičnih sistemov. Povezovanje različnih sistemov v sestav, mehanizacijo. Primeri sestavov in njihova analiza. Modeliranje raznih sestavov mehanizacije za specifične namene oz. področja. Predstavitev konceptualnih izračunov. Izdvojitev transportnih podsistemov. Transport trdnih kosov, tekočin in plinov. Transportni profili. Logistika transporta. Opredelitev orodja za izvajanje procesa. Sistemska zasnova energijskega izvora. Modeliranje spreminjanje energije v celotnem procesu od izvora do neposredne porabe. Seminarske naloge: Zasnova mehanizacije za izbrani proces. Modeliranje tehničnega sistema. Koncipiranje mehanskega sistema od energetskega izvora, spreminjanje energije glede na zahtevano obliko mehanskega dela in opredelitev orodja. Opredelitev parametrov vseh funkcij in njihovih poezav, ki omogočajo izvajanje krmiljenja. Analiza intervala parametrov na vstopu v mehanski sestav. Opredelitev primernega intervala vhodnih parametrov za koncipiranje predmetarnosti po funkcijah. Koncipiranje predmetarnosti po geometriji.	Processes in nature. Copying processes into functions. Division of processes into sub-processes and systems' sub-functions. Technical systems and their structure. Conceiving technical systems and sub-systems. Execution of mechanical, electrical, heat and optical systems. Combining various systems into an assembly, mechanical equipment. Examples of assemblies and their analysis. Modelling various assemblies of mechanical equipment for specific purposes and areas. Presentation of concept calculations. Extraction of transport sub-systems. Transport of solid parts, liquids and gases. Transport profiles. Transport logistics. Defining tools for process execution. Systems concept of the energy source. Modelling energy changes throughout the entire process, from source to direct consumption. Seminar work: Mechanical equipment concept for a selected process. Modelling a technical system. Conceiving a mechanical system from the energy source, energy changes with a view to the required shape of the mechanical part and defining the tool. Defining parameters of all functions and their relations that enable the application of control. Analysis of parameter intervals on entry into a mechanical assembly. Defining a suitable interval of input parameters for conceiving modularity by functions. Conceiving modularity by geometry.

Temeljna literatura in viri/Readings:

- Stjepandić, Josip (ur.), WOGNUM, Nel (ur.), VERHAGEN, Wim J. C. (ur.). Concurrent engineering in the 21st century : foundations, developments and challenges. Cham [etc.]: Springer. 2015.
- Wimmer W., Lee K. M., Quella F., Polak J., Ecodesign, The competitive advantage, Springer, 2010.
- Ulrich K. T., Eppinger S. D., Product design and development, McGreaw-Hill Education, New York, 2016.
- Hubka, V., Eder, W.E., 1988. Theory of Technical Systems: A Total Concept Theory for Engineering Design, Berlin Heidelberg: Springer-Verlag.
- Otto, K. N., Wood, K. L. Product design : techniques in reverse engineering and new product development, Upper Saddle River : Prentice Hall, 2001
- Vezzoli, C., Manzini, E. Design for environmental sustainability, London : Springer, 2008
- Srivastava, A. K. Engineering principles of agricultural
- Machines, 2nd ed., St. Jospeh : American Society of Agricultural and Biological Engineers, 2006
- Hoffmann, K, Krenn, E., Stanker,G. Fördertechnik. #Band #1, Bauelemente, ihre Konstruktion und Berechnung, 7. Aufl., Wien, München : R. Oldenbourg, 2005
- Hoffmann, K, Krenn, E., Stanker,G. Fördertechnik. #Band #2, Maschinensätze, Fördermittel, Tragkonstruktionen, Logistik, 5. Aufl., Wien, München: Oldenbourg, 2004

Cilji in kompetence:	**Objectives and competences:**
Izobraževalni cilji: Osnovni namen predmeta je osvojiti znanja o tehničnih procesih in njihovi izvedbi s tehničnimi sistemi. Glavni poudarek je namenjen zahtevam po trajnostnem razvoju: snovanju z uporabo nizko vplivnih materialov, uporabi podsistemov z nizko porabo energijo ter visokim izkoristkom energijskih pretvorb.	The main objective of the course is to acquire key knowledge of technical processes and their application by means of technical systems. The main emphasis is on the requirements of sustainable development: designing with the use of low-impact materials, using sub-systems with low energy consumption and highly efficient energy conversions.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Slušatelj je po zaključku predmeta usposobljen za samostojno in multidisciplinarno timsko delo na področju zasnove ali izbire ter analize primernih tehničnih procesov. Na njihovi osnovi je sposoben zasnovati ustrezne tehnične sisteme in ob tem upoštevati zahteve trajnostnega razvoja. Prav tako je na osnovi predmetarne gradnje sposoben oblikovati družine izdelkov, ki izvajajo izbrane procese.	After the course, students will be competent for individual and multidisciplinary team work in the areas of design or selection and analysis of suitable technical processes. On their basis, they will be capable of designing suitable technical systems, while simultaneously taking account of the requirements of sustainable development. On the basis of modular building, they are trained to design product families that carry out the selected processes.

Metode poučevanja in učenja:	**Learning and teaching methods:**
V primeru manjšega števila študentov pod 5 bo študij izveden po predloženi literaturi in s konzultacijami. Običajno pa s predavanji in vajami za pripravo seminarskih nalog.	In the event of fewer than 5 students, the course will be conducted in the form of consultations and with the use of the provided literature. The regular course will include lectures and exercises for the preparation of seminar work.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Kandidat lahko pristopi k ustnemu izpitu po predložitvi pozitivno ocenjene seminarske naloge.	100,00 %	A candidate can sit an oral examination after submitting a favourable assessment of seminar work.

Reference nosilca/Lecturer's references:

Leon Kos

1. KOS, Leon, PITTS, Richard, SIMIČ, G., BRANK, Matic, ANAND, H., ARTER, W. SMITER : a field-line tracing environment for ITER. *Fusion engineering and design*, ISSN 0920-3796. [Print ed.], Sep. 2019, vol. 146, pt. B, str. 1796-1800, ilustr. https://www.sciencedirect.com/science/article/pii/S092037961930359X?via%3Dihub, doi: 10.1016/j.fusengdes.2019.03.037. [COBISS.SI-ID 16530203], [JCR, SNIP, WoS do 25. 10. 2019: št. citatov (TC): 0, čistih citatov (CI): 0, čistih citatov na avtorja (CIAu): 0, Scopus do 1. 4. 2019: št. citatov (TC): 0, čistih citatov (CI):

0, čistih citatov na avtorja (CIAu): 0]
kategorija: 1A1 (Z, A', A1/2); uvrstitev: SCI, Scopus, MBP; tip dela je verificiral OSICN
točke: 16.67, št. avtorjev: **6**

2. ANAND, H., PITTS, Richard, VRIES, P. C. de, SNIPES, J. A., NESPOLI, F., LABIT, B., GALPERTI, C., CODA, S., BRANK, Matic, KOS, Leon. Experimental implementation of a real-time power flux estimator for the ITER first wall on the TCV tokamak. Fusion engineering and design. [Print ed.]. Oct. 2019, vol. 147, str. 1-7, ilustr. ISSN 0920-3796. https://www.sciencedirect.com/science/article/pii/S0920379619307203#!, DOI: 10.1016/j.fusengdes.2019.111242. [COBISS.SI-ID 16703771], [JCR, SNIP, WoS do 18. 10. 2019: št. citatov (TC): 0, čistih citatov (CI): 0, Scopus do 12. 7. 2019: št. citatov (TC): 0, čistih citatov (CI): 0]
3. KOS, Leon, JELIĆ, Nikola, GYERGYEK, Tomaž, KUHN, S., TSKHAKAYA, David. Modeling and simulations of plasma and sheath edges in warm-ion collision-free discharges. *AIP advances*, ISSN 2158-3226, Oct. 2018, vol. 8, no 10, str. 1-23, ilustr. https://aip.scitation.org/doi/pdf/10.1063/1.5044664?class=pdf, doi: 10.1063/1.5044664. [COBISS.SI-ID 12219988], [JCR, SNIP, WoS do 16. 11. 2018: št. citatov (TC): 0, čistih citatov (CI): 0, čistih citatov na avtorja (CIAu): 0, Scopus do 27. 10. 2018: št. citatov (TC): 0, čistih citatov (CI): 0, čistih citatov na avtorja (CIAu): 0]
kategorija: 1A3 (Z); uvrstitev: SCI, Scopus, MBP; tip dela je verificiral OSICN
točke: 14.18, št. avtorjev: 5
4. FALCHETTO, G. L., COSTER, D., COELHO, Roland J., KOS, Leon, KULOVEC, Simon, LENGAR, Igor, SNOJ, Luka, et al., ITM-TF Contributors ; ASDEX Upgrade Team ; JET-EFDA Contributors. The European Integrated Tokamak Modelling (ITM) effort : achievements and first physics results. *Nuclear fusion*, ISSN 0029-5515, 2014, iss. 4, vol. 54, 043018, doi: 10.1088/0029-5515/54/4/043018. [COBISS.SI-ID 27898919], [JCR, SNIP, WoS do 14. 7. 2019: št. citatov (TC): 37, čistih citatov (CI): 35, čistih citatov na avtorja (CIAu): 1.13, Scopus do 27. 7. 2019: št. citatov (TC): 32, čistih citatov (CI): 31, čistih citatov na avtorja (CIAu): 1.00] kategorija: 1A1 (Z, A', A1/2); uvrstitev: SCI, Scopus, MBP; tip dela je verificiral OSICN
5. TSKHAKAYA, D. D., KOS, Leon. Comprehensive kinetic analysis of the plasma-wall transition layer in a strongly tilted magnetic field. Physics of plasmas, ISSN 1070-664X, 2014, vol. 21, nr. 10, str. 1-13, ilustr., doi: 10.1063/1.4900765. [COBISS.SI-ID 13954331], [JCR, SNIP, WoS do 10. 3. 2019: št. citatov (TC): 15, čistih citatov (CI): 14, čistih citatov na avtorja (CIAu): 7.00, Scopus do 27. 1. 2019: št. citatov (TC): 14, čistih citatov (CI): 12, čistih citatov na avtorja (CIAu): 6.00] kategorija: 1A2 (Z, A1/2); uvrstitev: SCI, Scopus, MBP; tip dela je verificiral OSICN, točke: 47.69, št. avtorjev: 2
6. KOS, Leon, JELIĆ, Nikola, KUHN, S., TSKHAKAYA, David. Introduction to the theory and application of a unified Bohm criterion for arbitrary-ion-temperature collision-free plasmas with finite Debye lengths. Physics of plasmas. 2018, vol. 25, iss. 4, str. 1-16, ilustr. ISSN 1070-664X. https://aip.scitation.org/doi/10.1063/1.5030121, DOI: 10.1063/1.5030121. [COBISS.SI-ID 16310555], [JCR, SNIP, Scopus do 30. 11. 2018: št. citatov (TC): 1, čistih citatov (CI): 0]
7. TSKHAKAYA, D. D., KOS, Leon, TSKHAKAYA, D. D. Stability of the Tonks-Langmuir discharge pre-sheath. Physics of plasmas. Mar. 2016, vol. 23, iss. 3, str. 1-10, ilustr. ISSN 1070-664X. http://scitation.aip.org/content/aip/journal/pop/23/3/10.1063/1.4944916, DOI: 10.1063/1.4944916. [COBISS.SI-ID 14587675], [JCR, SNIP, WoS do 13. 1. 2019: št. citatov (TC): 4, čistih citatov (CI): 4, Scopus do 30. 11. 2018: št. citatov (TC): 4, čistih citatov (CI): 4]
8. DUHOVNIK, Jože, KLJAJIN, Milan, OPALIĆ, Milan, KOS, Leon, ZADNIK, Žiga, TAVČAR, Jože, KOLŠEK, Tomaž, DEMŠAR, Ivan, TOMŠIČ, Pavel, KULOVEC, Simon. *Inženirska grafika*. 1. izd. Ljubljana: Fakulteta za strojništvo, 2009. 1 zv. (loč. pag.), ilustr. ISBN 978-961-6536-31-8. [COBISS.SI-ID 247360256]
kategorija: 2NK (S); tipologija ni verificirana, točke: 0.5, št. avtorjev: 10
9. KOS, Leon, TSKHAKAYA, D. D. Theory of ion-matrix-sheath dynamics. *AIP advances*, ISSN 2158-3226, 2018, vol. 8, f. 015202-1-015202-13, ilustr., doi: 10.1063/1.5017654. [COBISS.SI-ID 15819547], [JCR, SNIP, WoS do 9. 6. 2019: št. citatov (TC): 1, čistih citatov (CI): 1, čistih citatov na avtorja (CIAu): 0.50, Scopus do 29. 5. 2019: št. citatov (TC): 1, čistih citatov (CI): 1, čistih citatov na avtorja (CIAu): 0.50]
kategorija: 1A3 (Z); uvrstitev: SCI, Scopus, MBP; tip dela je verificiral OSICN, točke: 35.44, št. avtorjev: 2
10. KOS, Leon, TSKHAKAYA, D. D., JELIĆ, Nikola. Unified Bohm criterion. *Physics of plasmas*, ISSN 1070-664X, 2015, vol. 22, str. 1-5, ilustr. http://scitation.aip.org/content/aip/journal/pop/22/9/10.1063/1.4930207, doi: 10.1063/1.4930207. [COBISS.SI-ID 14168603], [JCR, SNIP, WoS do 13. 10. 2019: št. citatov (TC): 8, čistih citatov (CI): 8, čistih citatov na avtorja (CIAu): 2.67, Scopus do 28. 10. 2019: št. citatov (TC): 9, čistih citatov (CI): 8, čistih citatov na avtorja (CIAu): 2.67], kategorija: 1A2 (Z, A1/2); uvrstitev: SCI, Scopus, MBP; tip dela je verificiral OSICN, točke: 31.92, št. avtorjev: 3

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Tehnični informacijski sistemi
Course title:	Technical information systems

Študijski programi in stopnja	Študijska smer	Letnik	Semestri
Bioznanosti, tretja stopnja, doktorski	Ni členitve (študijski program)		Celoletni

Univerzitetna koda predmeta/University course code: 3836

Predavanja	Seminar	Vaje	Klinične vaje	Druge oblike študija	Samostojno delo	ECTS
10	5	10	0	10	90	5

Nosilec predmeta/Lecturer: Leon Kos

Vrsta predmeta/Course type: teoretični/theoretical

Jeziki/Languages:		
	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij	General conditions for enrolment in doctoral studies.

Vsebina:	Content (Syllabus outline):
Proizvodni sistem. Razvojni, izdelovalni, komercialni, finančni in upravljalski sistemi v proizvodnji. Informacijski sistemi v proizvodnji ERP, PDM in PLM sistemi. Izdelek ali storitev kot nosilec procesa. Popis izdelka ali storitve s podatki, ki so pomembni za celoten življenjski cikel. Življenjski cikel izdelka. Spremljanje izdelka skozi življenjski cikel. Prepoznavanje procesa v proizvodnji in generiranje podatkov o izdelku. Značilnosti PLM sistemov. Struktura PLM sistemov. Uvajanje PLM sistemov v proizvodno okolje. Varovanje informacij. Delo v oblaku in vpliv na poslovni proces. ISO sistem zagotavljanja kakovosti. Logična povezava ISO sistema z uporabo PDM/PLM sistemov. Seminarske naloge: Popis realnega izdelka s podatki. Izdelki v življenjskem ciklu. Spremljanje podatkov izdelka skozi ves čas življenjskega cikla. Opredelitev zaznave pravega podatka v določenem času. Modeliranje procesiranja podatkov v določenem procesu. Identifikacija podatkov za kakovostno upravljanje. Prenos podatkov določen PDM/PLM sistem.	Production system. Development, manufacturing, commercial, financial and management systems in production. Information systems in production. ERP, PDM and PLM systems. A product or service as a process holder. Cataloguing a product or service with data that are important for its entire life cycle. A product's life cycle. Monitoring a product throughout its life cycle. Recognizing a process in the production and generation of product data. PDM systems characteristics. PDM systems structure. Introducing PDM/PLM systems into the production environment. Cloud computing. Data security. ISO quality assurance. Logical connection of the ISO system with the use of PDM/PLM systems. Seminar work: Cataloguing a real product with data. Life cycle of products. Monitoring product data throughout its life cycle. Defining the detection of relevant information at a specific time. Modelling of data processing in a specific process. Identification of data for good quality management. Transfer of data to a specific PDM/PLM system.

Temeljna literatura in viri/Readings:

Abramovici M., Aidi Y. (2013) Next Generation Product Lifecycle Management (PLM). In: Fathi M. (eds) Integration of Practice-Oriented Knowledge Technology: Trends and Prospectives. Springer, Berlin, Heidelberg

John Stark, Product Lifecycle Management (Volume 1): 21st Century Paradigm for Product Realisation, Springer, 2019 (4th edition)

John Stark, Product Lifecycle Management (Volume 2): The Devil is in the details, Springer, 2016
John Stark, Product Lifecycle Management (Volume 3): The Executive Summary, Springer, 2018
DUHOVNIK, Jože, TAVČAR, Jože. Elektronsko poslovanje in tehnični informacijski sistemi : PDMS - products data management systems, (Konstruiranje: raziskave, razvoj in uporaba, 2). 1. tisk. Ljubljana: LECAD, Fakulteta za strojništvo, 2000. 243 str. loč. pag., [7] f. zganj. pril., ilustr., tabele. ISBN 961-6238-43-4. [COBISS.SI-ID 108401920]
Eigner, M.; Stelzer, R.: Product Lifecycle Management. Ein Leitfaden für Product Development und Lifecycle Management. 2. Auflage. Springer Verlag : Berlin Heidelberg, 2009.
BELLIVEAU, P. GRIFFIN, A., SOMERMEYER, S. The PDMA toolbook for new product development, Hoboken: Wiley, 2004.

Cilji in kompetence:	**Objectives and competences:**
Izobraževalni cilji: Osnovni namen predmeta je pregledati funkcionalnost PDM/PLM sistemov: inženirski model izdelka, kontrola dostopa, informacijski tok in odobritve, klasifikacijski modeli, strukturna kosovnica, prekrivanje funkcionalnosti z drugimi informacijskimi sistemi. Velika pozornost bo namenjena modeliranju procesov, ker dober model predstavlja izhodišče za optimiranje in obvladovanju podakov o izdelku skozi celoten življenjski cikel; kot izhodišče bo vzet ARIS model.	The main aim of the course is to survey the functionality of PDM/PLM systems: engineering product models, access control, information flow and approvals, classification models, structural and modular parts list, overlapping between functionality and other information systems. Special attention will be paid to the modelling of processes, because a good model is the basis for optimizing and management of product data throughout its life-cycle; the ARIS model will be taken as the reference.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Slušatelj je po zaključku predmeta usposobljen za samostojno in multidisciplinarno timsko delo na področju sledenja podatkov o izdelkih skozi celoten življenjski cikel. Na ugotovljenem informacijskem toku bo sposoben zasnovati model podjetja, ki je izhodišče za prenovo in optimizacijo poslovanja.	After the course, the student is trained for individual and multidisciplinary team work in the area of products data tracing throughout their life cycles. With the established information flow, he or she will be capable of devising a company model that is the basis for the reform and optimization of business activities.

Metode poučevanja in učenja:	**Learning and teaching methods:**
V primeru manjšega števila študentov pod 5 bo študij izveden po predloženi literaturi in s konzultacijami. Običajno pa s predavanji in vajami za pripravo seminarskih nalog. Pomemben delež zajema samostojno delo z uporabo pridobljenih znanj na konkretnem primeru.	In the event of fewer than 5 students, the course will be conducted in the form of consultations and with the use of the provided literature. The regular course will include lectures and exercises for the preparation of project work. Individual work with application of PLM knowledge is an important part of teaching methods.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Kandidat lahko pristopi k ustnemu izpitu po predložitvi pozitivno ocenjene seminarske naloge. Poročilo seminarske naloge	30,00 %	A candidate can do oral examination after submitting a favourable assessment of project work report. Project work report
Ustni zagovor	40,00 %	Oral examination
Uporabna vrednost in zahtevnost izvedenega primera	30,00 %	The use value and complexity of the case study

Reference nosilca/Lecturer's references:

Leon Kos

1. KOS, Leon, PITTS, Richard, SIMIČ, G., BRANK, Matic, ANAND, H., ARTER, W. SMITER : a field-line tracing environment for ITER. *Fusion engineering and design*, ISSN 0920-3796. [Print ed.], Sep. 2019, vol. 146, pt. B, str. 1796-1800, ilustr. https://www.sciencedirect.com/science/article/pii/S092037961930359X?via%3Dihub, doi: 10.1016/j.fusengdes.2019.03.037. [COBISS.SI-ID 16530203], [JCR, SNIP, WoS do 25. 10. 2019: št. citatov (TC): 0, čistih citatov (CI): 0, čistih citatov na avtorja (CIAu): 0, Scopus do 1. 4. 2019: št. citatov (TC): 0, čistih citatov (CI): 0, čistih citatov na avtorja (CIAu): 0]

kategorija: 1A1 (Z, A', A1/2); uvrstitev: SCI, Scopus, MBP; tip dela je verificiral OSICN
točke: 16.67, št. avtorjev: **6**

2. ANAND, H., PITTS, Richard, VRIES, P. C. de, SNIPES, J. A., NESPOLI, F., LABIT, B., GALPERTI, C., CODA, S., BRANK, Matic, KOS, Leon. Experimental implementation of a real-time power flux estimator for the ITER first wall on the TCV tokamak. Fusion engineering and design. [Print ed.]. Oct. 2019, vol. 147, str. 1-7, ilustr. ISSN 0920-3796. https://www.sciencedirect.com/science/article/pii/S0920379619307203#!, DOI: 10.1016/j.fusengdes.2019.111242. [COBISS.SI-ID 16703771], [JCR, SNIP, WoS do 18. 10. 2019: št. citatov (TC): 0, čistih citatov (CI): 0, Scopus do 12. 7. 2019: št. citatov (TC): 0, čistih citatov (CI): 0]
3. KOS, Leon, JELIĆ, Nikola, GYERGYEK, Tomaž, KUHN, S., TSKHAKAYA, David. Modeling and simulations of plasma and sheath edges in warm-ion collision-free discharges. *AIP advances*, ISSN 2158-3226, Oct. 2018, vol. 8, no 10, str. 1-23, ilustr. https://aip.scitation.org/doi/pdf/10.1063/1.5044664?class=pdf, doi: 10.1063/1.5044664. [COBISS.SI-ID 12219988], [JCR, SNIP, WoS do 16. 11. 2018: št. citatov (TC): 0, čistih citatov (CI): 0, čistih citatov na avtorja (CIAu): 0, Scopus do 27. 10. 2018: št. citatov (TC): 0, čistih citatov (CI): 0, čistih citatov na avtorja (CIAu): 0]
kategorija: 1A3 (Z); uvrstitev: SCI, Scopus, MBP; tip dela je verificiral OSICN
točke: 14.18, št. avtorjev: 5
4. FALCHETTO, G. L., COSTER, D., COELHO, Roland J., KOS, Leon, KULOVEC, Simon, LENGAR, Igor, SNOJ, Luka, et al., ITM-TF Contributors ; ASDEX Upgrade Team ; JET-EFDA Contributors. The European Integrated Tokamak Modelling (ITM) effort : achievements and first physics results. *Nuclear fusion*, ISSN 0029-5515, 2014, iss. 4, vol. 54, 043018, doi: 10.1088/0029-5515/54/4/043018. [COBISS.SI-ID 27898919], [JCR, SNIP, WoS do 14. 7. 2019: št. citatov (TC): 37, čistih citatov (CI): 35, čistih citatov na avtorja (CIAu): 1.13, Scopus do 27. 7. 2019: št. citatov (TC): 32, čistih citatov (CI): 31, čistih citatov na avtorja (CIAu): 1.00] kategorija: 1A1 (Z, A', A1/2); uvrstitev: SCI, Scopus, MBP; tip dela je verificiral OSICN
5. TSKHAKAYA, D. D., KOS, Leon. Comprehensive kinetic analysis of the plasma-wall transition layer in a strongly tilted magnetic field. Physics of plasmas, ISSN 1070-664X, 2014, vol. 21, nr. 10, str. 1-13, ilustr., doi: 10.1063/1.4900765. [COBISS.SI-ID 13954331], [JCR, SNIP, WoS do 10. 3. 2019: št. citatov (TC): 15, čistih citatov (CI): 14, čistih citatov na avtorja (CIAu): 7.00, Scopus do 27. 1. 2019: št. citatov (TC): 14, čistih citatov (CI): 12, čistih citatov na avtorja (CIAu): 6.00] kategorija: 1A2 (Z, A1/2); uvrstitev: SCI, Scopus, MBP; tip dela je verificiral OSICN, točke: 47.69, št. avtorjev: 2
6. KOS, Leon, JELIĆ, Nikola, KUHN, S., TSKHAKAYA, David. Introduction to the theory and application of a unified Bohm criterion for arbitrary-ion-temperature collision-free plasmas with finite Debye lengths. Physics of plasmas. 2018, vol. 25, iss. 4, str. 1-16, ilustr. ISSN 1070-664X. https://aip.scitation.org/doi/10.1063/1.5030121, DOI: 10.1063/1.5030121. [COBISS.SI-ID 16310555], [JCR, SNIP, Scopus do 30. 11. 2018: št. citatov (TC): 1, čistih citatov (CI): 0]
7. TSKHAKAYA, D. D., KOS, Leon, TSKHAKAYA, D. D. Stability of the Tonks-Langmuir discharge pre-sheath. Physics of plasmas. Mar. 2016, vol. 23, iss. 3, str. 1-10, ilustr. ISSN 1070-664X. http://scitation.aip.org/content/aip/journal/pop/23/3/10.1063/1.4944916, DOI: 10.1063/1.4944916. [COBISS.SI-ID 14587675], [JCR, SNIP, WoS do 13. 1. 2019: št. citatov (TC): 4, čistih citatov (CI): 4, Scopus do 30. 11. 2018: št. citatov (TC): 4, čistih citatov (CI): 4]
8. DUHOVNIK, Jože, KLJAJIN, Milan, OPALIĆ, Milan, KOS, Leon, ZADNIK, Žiga, TAVČAR, Jože, KOLŠEK, Tomaž, DEMŠAR, Ivan, TOMŠIČ, Pavel, KULOVEC, Simon. *Inženirska grafika*. 1. izd. Ljubljana: Fakulteta za strojništvo, 2009. 1 zv. (loč. pag.), ilustr. ISBN 978-961-6536-31-8. [COBISS.SI-ID 247360256]
kategorija: 2NK (S); tipologija ni verificirana, točke: 0.5, št. avtorjev: 10

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Tehnologije v proizvodnji in predelavi mesa
Course title:	Technologies in meat production and processing

Študijski programi in stopnja	Študijska smer	Letnik	Semestri
Bioznanosti, tretja stopnja, doktorski	Ni členitve (študijski program)		Celoletni

Univerzitetna koda predmeta/University course code: 3837

Predavanja	Seminar	Vaje	Klinične vaje	Druge oblike študija	Samostojno delo	ECTS
10	25	0	0	5	85	5

Nosilec predmeta/Lecturer: Lea Demšar

Vrsta predmeta/Course type: teoretični/theoretical

Jeziki/Languages:		
	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Diplomanti enovitih magistrskih študijskih programov in študijskih programov 2. stopnje s področja biomedicinskih, biotehniških in naravoslovno matematičnih usmeritev.	Graduates of uniform master's degree programs and programs of 2nd degree in the field of biomedical, biotechnology and natural-mathematical orientation.

Vsebina:	**Content (Syllabus outline):**
Predklavne tehnologije- protistresni principi (zbiranje, nakladanje, transport, vhlevljanje živali) Primarna obdelava klavnih živali in perutnine –principi in tehnološke linije za omamljanje, zakol, razsek, kontrolo trupov. Primarno konzerviranje mesa -principi in tehnologije - hlajenje, zmrzovanje (konvekcijski, kondukcijski, imerzijski, kriogeni postopki) Konzerviranje mesa -procesi in tehnološke linije (toplotni postopki-pasterizacija, sterilizacija; razsoljevanje, prekajevanje, radiacija, biološko konzerviranje, dehidracija, pakiranje- VP, CP MAP). Sodobni termični procesi obdelave mesa (omsko segrevanje, radiofrekvenčno dielektrično segrevanje, IR-segrevanje, UHT postopek, visokotlačno segrevanje). Nova oprema in tehnološke linije za predelavo mesa: razdevanje mesa (volk, kuter, mikrokuter), mehanski separatorji za prodobivanje MOM, mešalniki, polnilniki, zapiralniki, linije za oblikovanje sekljanin, prekajevalne (pirolizni, tekoči, elektrostatični dim) in zorilne komore. Sodobne metode pakiranja mesa in mesnin - modificirana atmosfera (MAP), aktivno pakiranje, inteligentno pakiranje Robotizacija kontrole kakovosti klavnih trupov-instrumentalne metode.	Pre-slaughter technologies – antistress principles (gathering, loading, transport, stabling of animals) Primary processing of slaughtered animals and poultry – principles and technological lines for stunning, slaughter, cuting, control of carcases. Primary conservation of meat – principles and technologies– cooling, freezing (convection, conduction, immersion, cryogenic procedures) Conserving meat – processes and technological lines (thermal procedures – pasteurisation, sterilisation; salting, smoking, radiation, biological conservation, dehydration, packaging – VP, ECTS MAP). Modern thermal processing of meat (omic heating, radiofrequency dialectric heating, IR-heating, UHT process, high pressure heating). New equipment and technological lines for processing meat: dismembering a carcase (cutter, microcutter), mechanical separators for production of MSM, mixers, fillers, closers, lines for production of restructured meats, smoking equipment (pyrolitic wood smoke, liquid smoke, electrostatic smoke) and ripening chambers.

Instrumentalna analiza senzoričnih parametrov kakovosti mesa in izdelkov–barva, vonj, okus (aroma), tekstura.	Modern methods of packing meat and meat products – modified atmosphere packing (MAP), active packing, intelligent packing. Robotisation of quality control of slaughtered carcases – instrumental methods. Instrumental analysis of sensory parameters of meat and meat product quality – colour, smell, taste (flavour), texture.

Temeljna literatura in viri/Readings:

Jensen, W. K., Devine, C. D., Dikeman, M. 2004. Encyklopedia of MEAT SCIENCES. Elsevier Ac. Press. Amsterdam. Izbrana poglavja cca. 200 str.
Da-Wen Sun, 2006. Thermal Food Processing. New Technologies and Quality Issues. CRC Taylor & Francis, Boca Raton, izbrana poglavja. cca. 150 str.
Nolet, L. M., Toldra, F. 2006. Advanced Technologies for Meat Processing. CRC Taylor & Francis, Boca Raton. Cca. 120 str.
Hui Y. H. et al., 2012. Handbook of Meat and Meat Processing. CRC Press, Taylor & Francis group, New York. Part IV, V, VI (p. 447-700), Cca. 250 str.

Cilji in kompetence:	**Objectives and competences:**
Izobraževalni cilji: Cilj je seznaniti študenta s kompleksnostjo specifičnih tehnoloških procesov in strojne opreme v tehnologijah pridobivanja, konzerviranja in distribucije mesa različnih živalskih vrst, ter s procesi in sodobno tehnološko opremo za proizvodnjo, kontrolo kakovosti in distribucijo mesnih izdelkov. Kompetence: Študijski rezultat je pridobiti dobro osnovo za evidentiranje raziskovalnih problemov v okviru obravnavanih tehnoloških procesov vezanih na specifično strojno opremo in za načrtovanje ter izvedbo raziskovalnega dela na tem področju.	Educational aims: The aim is to familiarise students with the complexity of specific technological processes and machinery in the technologies of producing, conserving and distributing meat of various animal species and with processes and modern technological equipment for production, quality contr and distribution of meat products. Competences: The intended learning outcome is to obtain a good basis for recording research problems within the framework of the technological processes connected with specific hardware and for planning and carrying out research work in this field.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Spoznati vso pestrost in kompleksnost strojne opreme in tehnoloških linij, ter poznavanje osnovnih fizikalno-kemijskih procesov, ki potekajo v tehnologijah proizvodnje, predelave in distribucije mesa in izdelkov.	Knowledge and understanding: Learn about the diversity and complexity of hardware and technological lines, as well as knowledge of basic physical and chemical processes taking place in the technologies of production, processing and distribution of meat and products.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, samostojen študij in izdelava projektne naloge.	Lectures, self-study and preparation of project tasks.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Seminar Študent na izbrani temi pripravi seminarsko nalogo, ki je predpogoj za opravljanje izpita.	50,00 %	The seminar Student at the chosen theme prepare a seminar paper, which is a prerequisite for the exam.
ustni izpit	50,00 %	oral examination

Reference nosilca/Lecturer's references:

izr. prof. dr. Lea Demšar

1. URBANČIČ, Simona, HADOLIN KOLAR, Majda, DIMITRIJEVIĆ, Dušanka, DEMŠAR, Lea, VIDRIH, Rajko. Stabilisation of sunflower oil and reduction of acrylamide formation of potato with rosemary extract during deep-fat frying. Lebensmittel-Wissenschaft + Technologie, ISSN 0023-6438, 2014, vol. 57, str. 671-678, doi: 10.1016/j.lwt.2013.11.002. [COBISS.SI-ID 4313976],
2. ANDRONIKOV, Darko, DEMŠAR, Lea, POLAK, Tomaž, ŽLENDER, Božidar. Texture and quality parameters of Slovenian dry-cured ham Kraški pršut according to mass and to salt levels. Food technology and biotechnology, ISSN 1330-9862, 2013, vol. 51, no. 1, str. 112-122. [COBISS.SI-ID 4079992]
3. KADIVEC, Mirta, MOŽE BORNŠEK, Špela, POLAK, Tomaž, DEMŠAR, Lea, HRIBAR, Janez, POŽRL, Tomaž. Phenolic content of strawberry spreads during processing and storage. Journal of agricultural and food chemistry, ISSN 0021-8561, 2013, vol. 61, str. 9220-9229, doi: 10.1021/jf4035767. [COBISS.SI-ID 4287864]
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