POSEBNI POSTOPKI OBDELAVE

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	POSEBNI POSTOPKI OBDELAVE
Course title:	NONCONVENTIONAL MACHINING PROCESSES
Članica nosilka/UL Member:	UL FS

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Strojništvo, tretja stopnja, doktorski	Proizvodno inženirske znanosti, kibernetika in mehatronika (smer)	1. letnik, 2. letnik	Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0033464
Koda učne enote na članici/UL Member course code:	7309

Predavanja /Lectures	Seminar /Seminars	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
90					160	10

Nosilec predmeta/Lecturer:	Joško Valentinčič

Izvajalci predavanj:	Joško Valentinčič
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	Izbirni predmet /Elective course

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Veljajo splošni pogoji za doktorski študij.	General prerequisites for the third level studies.

Vsebina:	**Content (Syllabus outline):**
Razvoj kombiniranih in posebnih postopkov obdelave s poudarkom na mikrotehnologijah. Stanje razvoja tehnologij posebnih postopkov in ustreznih obdelovalnih sistemov v svetu in pri nas. Opredelitev procesov glede na vrsto energije pri odnašanju. Obravnava energijskih modelov pri mehanskih, elektrokemičnih, kemičnih in elektrotermičnih procesih obdelave. Vplivi procesov na obdelovani material z vidika procesov odnašanja in nanašanja. Študij specifičnih primerov enotskih dogodkov pri mikro in makro obdelavi izdelkov. Podrobna obravnava fizikalno kemijskih lastnosti in tehnoloških značilnosti važnejših predstavnikov posebnih postopkov. Brušenje v magnetnem polju, elektrokemijsko brušenje, ultrazvočna obdelava, obdelava z abrazivnim vodnim curkom, rezanje s CO2 laserjem, obdelava z elektronskim in ionskim žarkom, elektroerozijska obdelava, kemična in elektrokemična obdelava. Merilne metode in metode razpoznavanja posebnih postopkov obdelave, atributni popisi lastnosti postopkov, metode zajemanja znanja o procesih. Metode alternativnega načrtovanja tehnologij in optimiranja tehnologij z vidika kakovosti, ekonomičnosti, ekologije in trajnostnega razvoja.	Development of combined and special machining processes with emphasis on micro-technologies. State and development of special machining technologies and corresponding machining systems in the world and the local environment. Determination of processes regarding the type of cutting energy. Analysis of energy models for mechanical, electrochemical, chemical and electrothermal machining processes. Influence on machining material due to processes of cutting and deposition. Study of specific events in micro and macro machining of products. Analysis of physical and chemical properties and technologic characteristics of special machining processes. Grinding in magnetic field, electrochemical grinding, ultrasonic machining, abrasive water jet machining, cutting with CO2 laser, electron and ion beam machining, electro-discharge machining, chemical and electrochemical machining and lithography. Measuring methods and methods of identification of special machining processes, attributive description of process characteristics, methods of process parameters acquisition. Alternative technological design

Aplikacija pridobljenega znanja: v okviru seminarskega dela in vaj pri predmetu študent uporabi pridobljeno znanje na primeru znotraj doktorske teme, ki jo obravnava.	methods and optimization of technology in view of quality, economy, ecology and sustainable development. Application of acquired knowledge: in the context of the seminar work and practical exercises the student will apply acquired knowledge on an example with reference to his Ph.D. thesis.

Temeljna literatura in viri/Readings:

[1] Madou, Marc J.: Fundamentals of microfabrication : the science of miniaturization, Boca Raton [etc.] : CRC Press, cop. 2002, COBISS.SI-ID – 5498651
[2] Wolfson, Richard ; Pasachoff, Jay M.: Physics : with modern physics for scientists and engineers, Reading [etc.] : Addison-Wesley, cop. 1999, COBISS.SI-ID – 3319067
[3] Kalpakjian, Serope; Schmid, Steven R.: Manufacturing engineering and technology, Singapore [etc.] : Pearson Education South Asia, cop. 2014, COBISS.SI-ID – 13159707
[4] Qin, Yi: Micro-manufacturing engineering and technology, Amsterdam [etc.] : Elsevier : William Andrew, cop. 2010, COBISS.SI-ID – 34316549
[5] Tosello, Guido: Micro injection molding, Munich ; Cincinnati : Hanser, cop. 2018, COBISS.SI-ID – 146819075
[6] Drstvenšek, Igor, Dolinšek; Slavko Additive layered manufacturing : education, application and business, Maribor : Faculty for Mechanical Engineering, 2010 ([Pesnica pri Mariboru] : Garb), COBISS.SI-ID – 65536513
[7] Izdebska-Podsiadly, Joanna: Polymers for 3D printing : methods, properties, and characteristics, Amsterdam [etc.] : Elsevier : William Andrew, 2022, COBISS.SI-ID – 111572483
[8] Dietrich, David M. ; Kenworthy, Michael ; Cudney, Elizabeth A.: Additive manufacturing change management : best practices, Boca Raton [Florida] ; London ; New York : CRC Press, cop. 2019, COBISS.SI-ID – 17105667
[9] Gibson, Ian ; Rosen, David ; Stucker, Brent: Additive manufacturing technologies : 3D printing, rapid prototyping and direct digital manufacturing, New York : Springer, cop. 2015, COBISS.SI-ID – 13909019

Cilji in kompetence:	**Objectives and competences:**
Cilji: Poglobljeno spoznavanje nekonvencionalnih obdelovalnih tehnologij z vidika fizikalne osnove procesov ter njihovih tehnoloških zmogljivostih. Uporaba/vloga mikro-tehnologij v sodobnih proizvodnih procesih. **Kompetence:** Obvladovanje nekonvencionalnih tehnologij in procesov ter sposobnost	**Goals:** Deeper understanding of physical processes in nonconventional machining technologies and their technological performances. Applications/role of micro-technologies in modern production processes **Competences:** Mastering of nonconventional technologies and processes, ability to optimize technological solutions.

optimiranja tehnoloških rešitev. Razpoznavanje, meritve, spremljanje, modeliranje, simulacija in vodenje procesov.	Identification, metrology, monitoring, modeling, simulation and control of processes

Predvideni študijski rezultati:	**Intended learning outcomes:**
Obvladovanje nekonvencionalnih tehnologij in procesov ter sposobnost optimiranja tehnoloških rešitev. Razpoznavanje, meritve, spremljanje, modeliranje, simulacija in vodenje procesov.	Mastering of nonconventional technologies and processes, ability to optimize technological solutions. Identification, metrology, monitoring, modeling, simulation and control of processes

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, laboratorijske vaje, seminarsko delo, e-izobraževanje, konzultacije. Seminarsko delo v čim večji meri navezujoče se na področje doktorskega raziskovanja. Študij z uporabo priporočene literature.	Lectures, laboratory practice & seminar work, e-education, consulting. The seminar work is related, as much as possible, to the student's doctoral research field. Study on a recommended literature basis.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Ustni izpit, poročilo o seminarskem delu. Pogoj za opravljanje ustnega izpita je uspešno izdelano in pozitivno ocenjeno seminarsko delo. Način (ustno izpraševanje, naloge, projekt): • naloge (10%) • projekt (seminarska naloga) (50%) • ustno izpraševanje (40%)		Oral exam, report on seminar work. The condition for admission to oral exam is successful completion of seminar work, rewarded with a passing grade. Method (assignments, project, oral examination): • assignments (10%) • project (seminar assignment) (50%) • oral examination (40%)

Ocenjevalna lestvica:	**Grading system:**

Reference nosilca/Lecturer's references:

izr. prof. dr. Joško VALENTINČIČ

ŠADL, Matej, LEBAR, Andrej, VALENTINČIČ, Joško, URŠIČ NEMEVŠEK, Hana. Flexible energy-storage ceramic thick-film structures with high flexural fatigue endurance. ACS applied energy materials, ISSN 2574-0962, 2022, vol. 5, no. 6, str. 6896-6902, doi: 10.1021/acsaem.2c00518. [COBISS.SI-ID 110882307], [JCR, SNIP, WoS do 5. 12. 2022: št. citatov (TC): 2, čistih citatov (CI): 1, Scopus do 1. 1. 2023: št. citatov (TC): 2, čistih citatov (CI): 1]

JERMAN, Marko, ORBANIĆ, Henri, VALENTINČIČ, Joško. CFD analysis of thermal fields for ice abrasive water jet. International journal of mechanical sciences, ISSN 0020-7403, Apr. 2022, vol. 220, str. 1-41, ilustr. https://www.sciencedirect.com/science/article/pii/S0020740322000820, doi: 10.1016/j.ijmecsci.2022.107154. [COBISS.SI-ID 98152707], [JCR, SNIP, WoS do 5. 1. 2023: št. citatov (TC): 3, čistih citatov (CI): 3, Scopus do 4. 4. 2023: št. citatov (TC): 4, čistih citatov (CI): 4]

VALENTINČIČ, Joško, BISSACCO, Giuliano, TRISTO, Gianluca. Uncertainty of the electrode wear on-machine measurements in micro EDM milling. Journal of manufacturing processes, ISSN 1526-6125. [Print ed.], Apr. 2021, vol. 64, str. 153-160

JERMAN, Marko, ZELEŇÁK, Michal, LEBAR, Andrej, FOLDYNA, Vladimir, FOLDYNA, Josef, VALENTINČIČ, Joško. Observation of cryogenically cooled ice particles inside the high-speed water jet. Journal of materials processing technology, ISSN 0924-0136, Mar. 2021, vol. 289, str. 1-9, ilustr. https://www.sciencedirect.com/science/article/pii/S0924013620303642?via%3Dihub#!, doi: 10.1016/j.jmatprotec.2020.116947. [COBISS.SI-ID 34129411], [JCR, SNIP, WoS do 10. 11. 2022: št. citatov (TC): 6, čistih citatov (CI): 5, Scopus do 26. 11. 2022: št. citatov (TC): 7, čistih citatov (CI): 6]

JERMAN, Marko, VALENTINČIČ, Joško, LEBAR, Andrej, ORBANIĆ, Henri. The study of abrasive water jet cutting front development using a two-dimensional cellular automata model. Strojniški vestnik, ISSN 0039-2480, May 2015, vol. 61, no. 5, str. 292-302, ilustr., doi: 10.5545/sv-jme.2014.2179.