# UČNI NAČRT PREDMETA/COURSE SYLLABUS

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| **Predmet:** | POSEBNI POSTOPKI OBDELAVE |
| **Course title:** | NONCONVENTIONAL MACHINING PROCESSES |

| **Študijski programi in stopnja** | **Študijska smer** | **Letnik** | **Semestri** |
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| Strojništvo, tretja stopnja, doktorski | Proizvodno inženirske znanosti, kibernetika in mehatronika (smer) | | Celoletni |

**Univerzitetna koda predmeta/University course code:** 7309

| **Predavanja** | **Seminar** | **Vaje** | **Klinične vaje** | **Druge oblike študija** | **Samostojno delo** | **ECTS** |
|---|---|---|---|---|---|---|
| 90 | | | | | 160 | 10 |

**Nosilec predmeta/Lecturer:** Joško Valentinčič

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| **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

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

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

| **Vsebina:** | **Content (Syllabus outline):** |
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| 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.<br>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.<br>Merilne metode in metode razpoznavanja posebnih | 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.<br>Determination of processes regarding the type of cutting energy. Analysis of energy models for mechanical, electrochemical, chemical and electrothermal machining processes.<br>Influence on machining material due to processes of cutting and deposition. Study of specific events in micro and macro machining of products.<br>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 |

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| 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.<br>Aplikacija pridobljenega znanja: v okviru seminarskega dela in vaj pri predmetu študent uporabi pridobljeno znanje na primeru znotraj doktorske teme, ki jo obravnava. | electrochemical machining and lithography.<br>Measuring methods and methods of identification of special machining processes, attributive description of process characteristics, methods of process parameters acquisition. Alternative technological design methods and optimization of technology in view of quality, economy, ecology and sustainable development.<br>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] Taniguchi, N.: Energy - beam processing of materials:advanced manufacturing using various energy sources.- Oxford: Clarendon Press (Oxford University Press), 1989
[2] Blatt, F.J.: Modern physics.- New York [etc.]: McGraw-Hill, Inc., 1992
[3] Han, M.Y.: The secret life of quanta.- Blue Ridge Summit, Pa: TAB Books, 1990
[4] Nanotechnology: research and perspectives: papers from the first foresight conference on nanotechnology, [held in Palo Alto, California in October 1989] / ed. by B.C. Crandall and J. Lewis.- Cambridge, Mass.; London, England: The MIT Press, 1992
[5] Reichl: Micro-system technologies 92.- Vde Verlag, 1992
[6] Condition - based maintenance and machine diagnostics / ed. John H. Williams, Alan Davies and Paul R. Drake.- London [etc.]: Chapman & Hall, 1994
[7] JET cutting technology / ed. D. Saunders.- London; New York: Elsevier Science Publishers Ltd., 1991.- International symposium on jet cutting technology (10; 1990; Amsterdam)
[8] Handbook of micro/nanotribology / ed. by B. Bhushan.- Boca Raton [etc.]: CRC Press, cop. 1995.- (Mechanical and materials science series; 1)
[9] Schoen, S., Sykes, W.G.: Putting artificial intelligence to work: evaluating & implementing business applications.- New York [etc.]: John Wiley & Sons, 1988
[10] De Callatay, A.M.: Natural and artificial intelligence: misconceptions about brains and neural networks.- Amsterdam [etc.]: North-Holland: Elsevier Science Publ., 1992
[11] Edosomwan, Johnson, Aimie: Integrating innovation and technology management.- New York [etc.]: JohnWiley & Sons, 1989.- (Wiley series in engineering and technology management)
[12] Junkar, M; Nekonvencionalni postopki obdelave (skripta)


| **Cilji in kompetence:** | **Objectives and competences:** |
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| **Cilji:**<br>Poglobljeno spoznavanje nekonvencionalnih obdelovalnih tehnologij z vidika fizikalne osnove procesov ter njihovih tehnoloških zmogljivostih.<br>Uporaba/vloga mikro-tehnologij v sodobnih proizvodnih procesih.<br>**Kompetence:**<br>Obvladovanje nekonvencionalnih tehnologij in procesov ter sposobnost optimiranja tehnoloških rešitev.<br>Razpoznavanje, meritve, spremljanje, modeliranje, simulacija in vodenje procesov. | **Goals:**<br>Deeper understanding of physical processes in nonconventional machining technologies and their technological performances.<br>Applications/role of micro-technologies in modern production processes<br>**Competences:**<br>Mastering of nonconventional technologies and processes, ability to optimize technological solutions.<br>Identification, metrology, monitoring, modeling, simulation and control of processes |

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

| **Metode poučevanja in učenja:** | **Learning and teaching methods:** |
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| Predavanja, laboratorijske vaje, seminarsko delo, e- | Lectures, laboratory practice & seminar work, e- |

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| izobraževanje, konzultacije. Seminarsko delo v čim večji meri navezujoče se na področje doktorskega raziskovanja. Študij z uporabo priporočene literature. | 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:** |
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| 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%) |

**Reference nosilca/Lecturer's references:**

**izr.prof.dr. Joško VALENTINČIČ**

BISSACCO, G., VALENTINČIČ, Joško, HANSEN, H.N., WIWE, B.D. Towards the effective tool wear control in micro-EDM milling. The international journal of advanced manufacturing technology, ISSN 0268-3768, Mar. 2010, vol. 47, no. 1-4, str. 3-9, doi: 10.1007/s00170-009-2057-0.

TRISTO, Gianluca, BISSACCO, Giuliano, LEBAR, Andrej, VALENTINČIČ, Joško. Real time power consumption monitoring for energy efficiency analysis in micro EDM milling. The international journal of advanced manufacturing technology, ISSN 0268-3768, 2015, doi: 10.1007/s00170-014-6725-3.

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.

VALENTINČIČ, Joško, BRISSAUD, Daniel, JUNKAR, Mihael. EDM process adaptation system in toolmaking industry. Journal of materials processing technology, ISSN 0924-0136. [Print ed.], 2006, vol. 172, št. 2, str. 291-298. http://dx.doi.org/10.1016/j.jmatprotec.2005.10.019.

BISSACCO, Giuliano, TRISTO, Gianluca, HANSEN, H. N., VALENTINČIČ, Joško. Reliability of electrode wear compensation based on material removal per discharge in micro EDM milling. CIRP annals, ISSN 0007-8506, 2013, vol. 62, iss. 1, str. 179-182, ilustr., doi: 10.1016/j.cirp.2013.03.033.