

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

<b>Predmet:</b>	TEHNIČNI INFORMACIJSKI SISTEMI
<b>Course title:</b>	PRODUCT DATA MANAGEMENT SYSTEM

<b>Študijski programi in stopnja</b>	<b>Študijska smer</b>	<b>Letnik</b>	<b>Semestri</b>
Strojništvo, tretja stopnja, doktorski	Konstruktivsko mehanske inženirske znanosti (smer)		Celoletni

Univerzitetna koda predmeta/University course code:

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

**Nosilec predmeta/Lecturer:**

<b>Izvajalci predavanj:</b>	Jože Tavčar
<b>Izvajalci seminarjev:</b>	
<b>Izvajalci vaj:</b>	
<b>Izvajalci kliničnih vaj:</b>	
<b>Izvajalci drugih oblik:</b>	
<b>Izvajalci praktičnega usposabljanja:</b>	

**Vrsta predmeta/Course type:**

<b>Jeziki/Languages:</b>	<b>Predavanja/Lectures:</b>	Slovenščina, Angleščina
	<b>Vaje/Tutorial:</b>	Slovenščina, Angleščina

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

### Vsebina:

Gradniki in strukture tehničnih informacijskih sistemov (PDM/PLM), vloga v proizvodnem podjetju in virtualni projektni skupini. Proizvodni informacijski sistem, izdelek ali storitev kot nosilec procesa.

Metode za analizo informacijskih tokov v podjetju: funkcijski diagrami IDEF0, ARIS, organizacijski model, tok dokumentov, oddelčno časovni diagrami, model komunikacije, simulacije procesov, Petri mreže ipd.

Modeliranje podjetja, podatkov in procesov. E/R diagrami, EXPRESS jezik, objektni modeli. Podatkovni modeli za tehnike: STEP standard za izmenjavo in inženirski model izdelka od zasnove do proizvodnje in vzdrževanja.

Popis in spremljanje izdelka ali storitve s podatki skozi celoten življenjski cikel. Prepoznavanje procesa v proizvodnji in generiranje podatkov o izdelku.

Funkcionalnost poslovno – proizvodnih (ERP) in tehničnih informacijskih sistemov (PDM/PLM).

Pregled modulov iz področja tehničnih informacijskih

### Content (Syllabus outline):

An overview of building blocks and a structure of product data management systems (PDM/PLM), the role in a manufacturing company and virtual project team.

Production information system. Product or service as a carrier of the process.

Methods to analyse information flows: function diagrams IDEF0, ARIS model, organisation structure model, document flow, department – time diagram, model of communication, simulation of processes, Petri nets.

Modelling of an enterprise, product data and processes with E/R diagrams, EXPRESS language, object models.

Data models for engineering: STEP standard for exchange of product data from conceptual design to manufacturing and maintenance.

Product data model or service through the whole life-cycle. Product and process data identification and generation in the manufacturing process.

Functionality of production information systems (ERP).

Functionality of product data management systems

<p>sistemov: upravljanje z dokumenti, naravna klasifikacija, razvojna stanja gradnikov in dokumentov, pretok informacij in dokumentov, kosovnice: variantna, strukturna, modularna, povezava s CAD/CAM orodji, povezava s projektnim vodenjem.</p> <p>Osnove o varovanju podatkov: varnostne kopije, kontrola dostopa, varnost v medmrežju, identifikacija uporabnikov. Dolgoročno arhiviranje podatkov, zakonske zahteve, standardi (EDI, SGML). Tehnični informacijski sistem kot baza znanja in temelj za delo v virtualni razvojni skupini.</p> <p>Referenčni primeri rešitev za različne vrste podjetij z masovno, serijsko ali posamično proizvodno za značilne procese kot so obvladovanje tehničnih sprememb, tehnična dokumentacija, sistemi kakovosti.</p> <p>Postopek uvajanja tehničnega info-sistema v proizvodno podjetje ali v virtualno razvojno skupino.</p>	<p>(PDM/PLM).</p> <p>Overview of the modules in the PDM/PLM systems: documents management, natural classification, development phases of building blocks and documents, information and documents flow, bill of materials: variant, structural, modular, integration with CAD/CAM tools, integration with project management.</p> <p>Data security background: backups, access control, security in the Internet, user identification. Long-term data archiving, legislation requests, standards (EDI, SGML). PDM/PLM systems as knowledge database and as backbone for virtual product development teams.</p> <p>Reference examples for different type of production: mass, serial or individual. Reference models for key processes: engineering change management, technical documentation management, system documentation.</p> <p>Procedure of applying of product data management systems to manufacturing enterprise or to support virtual product development teams.</p>
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### Temeljna literatura in viri/Readings:

<p>[1] Rude S.: Wissenbasiertes Konstruieren, Shaker Verlag, Aachen, 1998</p> <p>[2] Prasad B.: Concurrent Engineering Fundamentals, Vol. I Integrated product and process, Prentice Hall 1996</p> <p>[3] Stefan Brandner, Markus Kelch, Helmut Stengele, Martin Eigner, Alexander Suhm, Gunther Reinhart,.: EDM Engineering Data Management, Seminarberichte, IWB, 1996</p> <p>[4] August- Wilhelm Scheer: ARIS - Architecture and Reference Models for Business Process Management, Springer 2000</p> <p>[5] Stark, J.: Engineering information management systems: beyond CAD/CAM to concurrent engineering support.- New York: Van Nostrand Reinhold, 1992.- (Automation in manufacturing series)</p>
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### Cilji in kompetence:

<p><b>Cilji:</b></p> <p>Predmet bo slušatelju dal poglobljeno razumevanje inženirskega modela izdelka v razvojno-konstruktivnem procesu, znal bo slediti nastajanju in spremljanju podatkov o izdelkih skozi celoten življenjski cikel. Pridobil bo znanje za modeliranje, analizo in optimiranje procesov v prostorsko razpršenem okolju okolju. Osvojil bo sposobnost povezovanja metodike konstruiranja in podpornih metod z informatiko. Slušatelji bodo znali opredeliti v različnih okoljih potrebne informacijske verige za vodenje in upravljanje proizvodnih ali storitvenih procesov. Za obvladovanje kompleksnih tehničnih sistemov v je informacijska podpora nujno potrebna. Znal bo strukturirati in učinkovito povezati podatke, ki nastajajo v razvojnem, proizvodnem ali storitvenem procesu. Zgoščen in nazoren model podjetja je izhodišče za prenavo in optimizacijo poslovanja.</p> <p><b>Kompetence:</b></p> <p>Slušatelj bo osvojil sistemski način razmišljanja in metode za informacijsko podporo. Sposoben bo prepoznati v različnih proizvodnih ali storitvenih procesih podatkovno strukturo. Usposobljen bo za modeliranje in analizo procesov, podatkovnih modelov in informacijskih tokov. Prepoznal bo potrebe in možnosti klasifikacije. Aktivno se bo vključil v interdisciplinaren tim pri snovanju in razvoju tehničnih informacijskih sistemov.</p>	<p><b>Objectives and competences:</b></p> <p><b>Goals:</b></p> <p>The subject will clarify the role of product data model in the R&amp;D process. Students will be able to follow creation and track product data through the whole product life cycle. He will gain knowledge for modelling, analyses and optimisation of processes at product development in the distributed environment. The student will be able to integrate methodology of design with other supported methods and informatics. The information chain of a working process shall be identified to enable manufacturing or service process management. Application of information system is a must to master complex technical systems. He will have knowledge to structure and effective integration of data that is created in the development and manufacturing process. A compact and clear company process model is a starting point for re-engineering and optimisation.</p> <p><b>Competences:</b></p> <p>The student will gain a systematic approach and methods for product data management systems (PDM/PLM). He will be able to recognise data structure in different manufacturing or service processes. He will have knowledge to model and analyse processes, product data models and information flows. He will have knowledge to understand the needs and possibilities of classification models. The student will be able to play an active role in the multidisciplinary team for PDM/PLM research and</p>
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<b>Predvideni študijski rezultati:</b>	<b>Intended learning outcomes:</b>
Slušatelj bo osvojil sistemski način razmišljanja in metode za informacijsko podporo. Sposoben bo prepoznati v različnih proizvodnih ali storitvenih procesih podatkovno strukturo. Usposobljen bo za modeliranje in analizo procesov, podatkovnih modelov in informacijskih tokov. Prepoznal bo potrebe in možnosti klasifikacije. Aktivno se bo vključil v interdisciplinaren tim pri snovanju in razvoju tehničnih informacijskih sistemov.	The student will gain a systematic approach and methods for product data management systems (PDM/PLM). He will be able to recognise data structure in different manufacturing or service processes. He will have knowledge to model and analyse processes, product data models and information flows. He will have knowledge to understand the needs and possibilities of classification models. The student will be able to play an active role in the multidisciplinary team for PDM/PLM research and development.

<b>Metode poučevanja in učenja:</b>	<b>Learning and teaching methods:</b>
Predavanja, laboratorijske vaje, seminarsko delo, e-izobraževanje, konzultacije. Seminarsko delo v čim večji meri navezuje 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.

<b>Načini ocenjevanja:</b>	<b>Delež/Weight</b>	<b>Assessment:</b>
Način (pisni izpit, ustno izpraševanje, naloge, projekt): - naloge (20%) - projekt (seminarska naloga) (50%) - ustno izpraševanje (30%)		Method (written exam, oral examination, assignments, project) • assignments (20%) • project (seminar assignment) (50%) • oral examination (30%)

<b>Reference nosilca/Lecturer's references:</b>
<p><b>izr.prof.dr. Jože TAVČAR</b></p> <p>DUHOVNIK, Jože, TAVČAR, Jože. Concurrent engineering in machinery : chapter 22. V: 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, f. 639-670, ilustr., doi: 10.1007/978-3-319-13776-6_22.</p> <p>SLAK, Aleš, TAVČAR, Jože, DUHOVNIK, Jože. Case study analysis and genetic algorithm adaptation for job process planning and scheduling in batch production. Journal of design research, ISSN 1748-3050, 2014, vol. 12, no. 1/2, str. 52-77, ilustr.</p> <p>SLAK, Aleš, TAVČAR, Jože, DUHOVNIK, Jože. Application of genetic algorithm into multicriteria batch manufacturing scheduling. Strojniški vestnik, ISSN 0039-2480, feb. 2011, vol. 57, no. 2, str. 110-124, ilustr., doi: 10.5545/sv-jme.2010.122.</p> <p>TAVČAR, Jože, ŽAVBI, Roman, VERLINDEN, Jouke, DUHOVNIK, Jože. Skills for effective communication and work in global product development teams. Journal of engineering design, ISSN 0954-4828. [Print ed.], 2005, letn. 16, št. 6, str. 557-576. <a href="http://www.tandf.co.uk/journals">http://www.tandf.co.uk/journals</a>.</p> <p>TAVČAR, Jože, DUHOVNIK, Jože. Engineering change management in individual and mass production. Robotics and computer-integrated manufacturing, ISSN 0736-5845. [Print ed.], 2005, letn. 21, št. 3, str. 205-215.</p> <p>TAVČAR, Jože, DUHOVNIK, Jože. Typical models of product data integration in small and medium companies. The international journal of advanced manufacturing technology, ISSN 0268-3768, 2000, vol. 16, issue 10, str. 748-758.</p>