

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Ciljno konstruiranje
Course title: Design Methods

Študijski program Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Inženiring in avtomobilska industrija		drugi	
		second	

Vrsta predmeta / Course type

Izbirni/optional

Univerzitetna koda predmeta / University course code:

21010

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
45	-	30		-	135	7

Nosilec predmeta / Lecturer:

prof. dr. Dorian Marjanović, prof.dr. Mario Štorga

**Jeziki /
Languages:**

**Predavanja /
Lectures:**
Vaje / Tutorial:

Angleščina/
english
Angleščina / english

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Prerequisites:

<ul style="list-style-type: none"> Pred izpitom mora študent(ka) uspešno opraviti praktične vaje, seminarje in projektne naloge. 	<ul style="list-style-type: none"> Successful completion of seminars and project assignments through individual and team presentations. Successful results on written partial exams during semester.
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Vsebina:

Content (Syllabus outline):

<p>Predavanja: Predmet obravnava hkratni pristop k vsem vidikom konstruiranja v smislu sočasnega inženirskega dela od prvotnega koncepta do razgradnje na koncu življenjske dobe izdelka. Predstavljene so smernice in orodja za doseganje različnih v praksi pomembnih konstrukcijskih ciljev, ki se nanašajo na ciljno vodeno konstruiranje oz. konstruiranje za:</p>	<ul style="list-style-type: none"> The course aims at the understanding of the design methods and tools with the focus on DfX goals, particularly: product life oriented engineering design and product life systems - manufacturing, safety, risks, ergonomics and environment. Introduction to engineering design methods and tools. Design goals structuring and problem solving.
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- proizvodnost in hitro izdelavo,
- montažo, sestavljanje in razstavljanje,
- okolje, parkiranje in recikliranje,
- stroškovno ustreznost-zniževanje stroškov,
- visoko kvaliteto in zanesljivost,
- življenjsko dobo,
- vzdržljivost in vzdrževalnost,
- izvedljivost,
- uporabnost in uporabniško prijaznost,
- ergonomijo in estetiko,
- učinkovito testiranje,
- najmanjši rizik – tveganje,
- logistiko.

Laboratorijske Vaje:

Laboratorijske vaje se izvajajo v računalniški učilnici in so namenjene spoznavanju možnosti, ki jih v smislu ciljno vodenega konstruiranja (predvsem konstruiranja za proizvodnjo) nudi sodobna programska CAD / CAM oprema.

Avditorne vaje in seminar:

V okviru avditornih vaj in seminarja študenti na praktičnih primerih spoznajo učinke posameznih smernic za ciljno vodeno konstruiranje in njihovo implementacijo na tehniški dokumentaciji.

- Product life cycle issues.
- Product architecture and complexity.
- Embodiment design.
- Embodiment design. Embodiment design.
- Written partial exam K1. Computational design synthesis.
- Detail design
- Rapid prototyping
- Design for manufacturing and assembling.
- Design for impact on environment..
- Design for robustness, safety and ergonomics.
- ECO Design
- Theory of Technical Systems and design theory.
- Information modelling of product and design process.

Exercises

Applications of design methods on DfX project assignments. Individual tasks and teamwork on tasks:
 Prioritization of design goals
 Embodiment design
 Computational design synthesis.
 Design for Environment
 Students will use available CAD/CAE tools and CES EduPack – Eco Audit Tool.

Temeljni literatura in viri / Readings:

- Ulrich, K.T., Eppinger, S.D.: Product Design and Development; McGraw Hill; 2004
- K Ehrlenspiel, A Kiewert, U Lindemann, MS Hundal: Cost-efficient Design, Springer, 2007.
- Eggert, R.J.: Engineering Design; Prentice HALL; 2005
- C. Q. Hauang: Design for X – concurrent engineering imperative, Chapman & Hall, 1996.
- Cross, N.: Engineering Design Methods: Strategies for Product Design; Wiley; 2008

Priporočljiva literatura / Recommended Textbooks

- Pahl, G., Beitz, W., Feldhusen, J., Grote, K.H.: Engineering Design: A Systematic Approach; Springer; 2007
- Hubka, V., Eder, W.E.: Theory of Technical Systems; Springer 1988.
- Matthews, C. : Case Studies in Engineering Design, Arnold, 1998.

Cilji in kompetence:

<p>Cilji</p> <ul style="list-style-type: none"> • spoznavanje osnovnih pojmov, metod in postopkov pri ciljnem konstruiranju, • spoznavanje konstrukcijskega procesa ob upoštevanju različnih konstrukcijskih ciljev, • spoznavanje uporabe sodobne računalniške opreme za ciljno konstruiranje. <p>Kompetence</p> <ul style="list-style-type: none"> • razumevanje hkratnega pristopa k zagotavljanju konstrukcijskih ciljev, • poznavanje smernic in priporočil za ciljno konstruiranje, • poznavanje pomena trajnostnega razvoja oz. ekoloških pogojev/smernic pri konstruiranju.

Objectives and competences:

<p>Objectives</p> <ul style="list-style-type: none"> • This course aims to present useful methods for mechanical designers, and to illustrate the practical application of Design for X methods. <p>Competences</p> <p>On completion of the course students should:</p> <ul style="list-style-type: none"> • be able to formulate a design problem, allowing the widest range of valid solutions; • be able to evaluate competing design concepts systematically; • be able to use techniques such as division of tasks and self-help in embodiment design; • know how to search for ways in which a design can fail, and assess the likelihood of failure;
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Predvideni študijski rezultati:

<p>Znanje in razumevanje: <i>Študent/študentka:</i></p> <ul style="list-style-type: none"> • Usposobljenost za metodično ciljno konstruiranje • Usposobljenost za hkratno upoštevanje konstrukcijskih ciljev in trajnostnega razvoja • Usposobljenost za hkratno uporabo dosedanjih in najnovejših virtualnih tehnologij • Ovrednotenje in izbira ustreznih konstrukcijskih priporočil.

Intended learning outcomes:

<p>Knowledge and understanding: <i>Student:</i></p> <ul style="list-style-type: none"> • To design innovative principles for fulfilling required functionality of the technical system. • To create the architecture of the technical system. • To create the embodiment and detailed design of components of the technical system. • To analyse the influence of criteria from different life cycle phases of the technical system.
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Metode poučevanja in učenja:

<ul style="list-style-type: none"> • Frontalna predavanja s testi • Vaje z uporabo virtualnih tehnologij • Projekt in seminarska naloga
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Learning and teaching methods:

<ul style="list-style-type: none"> • Lectures with continuous knowledge assessments • Exercises with individual and team design problem assignments. Written report and public oral presentation of the achievements.

Načini ocenjevanja:

**Delež (v %) / Assessment:
 Weight (in%)**

<ul style="list-style-type: none"> • Ustni izpit: 20 % • Stalno ocenjevanje na predavanjih • Vaje: 10 % • Projekt in seminarska naloga 		<p>Oral Eexamination 20% Course excersises 10% Written partial exams 20% Cursework 50%</p>
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Reference nosilca / Lecturer's references:

Sestavljalet učnega načrta: prof. dr. Anton Jezernik

Ključne reference nosilca:

Prof.dr. Dorian Marjanović

1. Milan Stevanović, Dorian Marjanović, Mario Štorga. IDEA Management in Product Innovation – The Empirical Research Results, Tehnički vjesnik/Technical Gazette Vol. 23/No. 5, October 2016.
2. Editorial board of IJDCI (2013) Perspectives on design creativity and innovation research , International Journal of Design Creativity and Innovation, 1:1, 1-42, DOI: 10.1080/21650349.2013.754657
3. Rohde, Danijel; Storga, Mario; Marjanović Dorian Design rationale capturing model for use during the embodiment phase of the product design TRANSACTIONS OF FAMENA Volume: 39 Issue: 1 Pages: 27-42 Published: 2015
4. Stanković Tino, Štorga Mario, Shea Kristina, Marjanović Dorian: "Formal Modelling of Technical Processes and Technical Process Synthesis", Taylor & Francis UK: Journal of Engineering Design, First published on: 24 September 2012 (iFirst), DOI: 10.1080/09544828.2012.722193
5. Pavković Neven, Štorga Mario, Bojčetić Nenad, Marjanović Dorian: "Facilitating design communication through engineering information traceability", Cambridge University Press: Artificial Intelligence for Engineering Design, Analysis and Manufacturing, 27, 2013, p. 91–105, DOI: 10.1017/S0890060413000012
6. Skec, Stanko; Storga, Mario; Marjanović Dorian Mapping risks on various product development process types TRANSACTIONS OF FAMENA Volume: 37 Issue: 3 Pages: 1-16 Published: 2013
7. Stanković Tino, Štorga Mario, Marjanović Dorian: "Synthesis of Truss Structure Designs by NSGA-II and NodeSort Method", Strojniški vestnik - Journal of Mechanical Engineering 58(2012)3, 203-212, DOI: 10.5545/sv-jme.2011.042 2012
8. Štorga, Mario; Andreasen, Mogens Myrup; Marjanović, Dorian: "The Design Ontology: Foundation for the Design Knowledge Exchange and Management", Taylor & Francis UK: Journal of Engineering Design, 21: 4, 2010, p. 427 — 454
9. Stankovic, Tino; Marjanovic, Dorian; Bojetic, Nenad; Enhancing evolution of truss structures by using genetic algorithms TRANSACTIONS OF FAMENA Volume: 33 Issue: 1 Pages: 1-10 Published: 2009
10. Pavkovic, N; Marjanovic, D; Storga, M Object-oriented framework for design process modeling and planning STROJARSTVO Volume: 47 Issue: 3-4 Pages: 87-100 Published: MAY-AUG 2005
11. Pavkovic, N; Marjanovic, D Considering an object-oriented approach to design process planning INTERNATIONAL JOURNAL OF TECHNOLOGY MANAGEMENT Volume: 21 Issue: 3-4 Pages: 373-392 Published: 2001
12. Mahalec, I; Lulic, Z; Marjanovic, D Motor vehicle approval in Croatia: costs and benefits INTERNATIONAL JOURNAL OF ENVIRONMENT AND POLLUTION Volume: 14 Issue: 1-6 Pages: 425-430 Published: 2000
13. Marjanović, D.: Design process representation for the development of an ICAD system. AUTOMATIKA, Volume: 37 , Issue: 3-4; 127-132 Published 1996
14. Kostelić, A, Marjkanović, D, Tasevski D, Solman, N, Milosevic, V, Computer-Aided Shell and Tube Heat- Exchangers Design-System KOCIT, Strojarstvo, V25, No. 3-4, pp.177-183, 1983

Prof.dr. Mario Štorga

1. Škec Stanko, Štorga Mario, Tečec Ribarić, Zlatka: "Work Sampling of Product Development Activities", Tehnički vjesnik, Tehnički fakulteti Sveučilišta Josip Juraj Perišić Marija Majda, Martinec Tomislav, Štorga Mario, Stanko Škec: "Development of Collaborative Design Agents Framework", 7th International Conference on Computing and Cognition DCC'16; Chicago, USA, 2016Strossmayer u Osijeku, Vol. 23 No. 6, 2016

2. Midžić Ida, Štorga Mario, Marjanović Dorian: "Validation of the Eco-transformity Method", 14th International DESIGN conference DESIGN 2016; FSB, Zagreb, The Design Society, Glasgow; 2016,
3. Perišić Marija Majda, Martinec Tomislav, Štorga Mario, Kanduc Tadej: "An Agent-based Approach to Support Management of Teams Performing Development Activities", 14th International DESIGN conference DESIGN 2016; FSB, Zagreb, The Design Society, Glasgow
4. Cash Phil, Štorga Mario: "Multifaceted Assessment of Ideation: Using Networks to Link Ideation and Design Activity", Taylor & Francis UK: Journal of Engineering Design, Vol. 26 Issue 10-12,
5. Cash, Phillip; Stanković, Tino; Štorga, Mario: Using visual information analysis to explore complex patterns in the activity of designers. // Design studies. 35 (2014) ,
6. Štorga, Mario; Mostashari, Ali; Stanković, Tino: Visualisation of The Organisation Knowledge Structure Evolution. // Journal of Knowledge Management. 17 (2013) , 5;
7. Pavković, Neven; Štorga, Mario; Bojčetić, Nenad: Product development ontology in traceability implementation framework. // Strojarstvo : Časopis za teoriju i praksu u strojarstvu. 49 (2007) , 2;
8. Cash, Phillip; Štorga, Mario: Multifaceted assessment of ideation: using networks to link ideation and design activity. // Journal of engineering design. 26 (2015) , 10-12; 391-415
9. Cash P., Stanković T., Štorga M.: "An Analysis of Engineers Information Seeking Activity", Proceedings of the ASME 2013 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference IDETC/CIE 2013, Portland, Oregon, USA, 2013.
10. Štorga M., Stanković T., Pavković N., Bojčetić N.: "Application Framework for Traceability of Engineering Information", Proceedings of the 19th International Conference on Engineering Design – ICED 13, Seoul, Korea, 2013
11. Savšek T., Štorga M., Cerovšek M.: "Information traceability in PLM Environment", Proceedings of the 10th Conference Innovative Automotive Technology – IAT 2012, Fajdiga, M. & Klemenc, J. (editors), Novo mesto / Dolenjske Toplice, Slovenia, 2012
12. Ahmed, Saeema; Štorga, Mario. Merged ontology for engineering design: Contrasting empirical and theoretical approaches to develop engineering ontologies. // Artificial Intelligence for Engineering Design, Analysis and Manufacturing. 23 (2009) ,
13. Bojčetić, Nenad; Žeželj, Dragan; Štorga, Mario: A Tool for Supporting the Process of Property Management and the Creation of Technical Drawings. // Transactions of FAMENA. 33 (2009)
14. Štorga, Mario; Pavković, Neven; Bojčetić, Nenad: Reducing the complexity of Product Development Context by Ontology. // Transaction of FAMENA. 30 (2006) ,