

UČNI NAČRT PREDMETA / COURSE SYLLABUS							
<b>Predmet:</b>		Računalniško podprto (geometrijsko) oblikovanje					
<b>Course title:</b>		Computer aided (geometric) design					
<b>Študijski program in stopnja</b> Study programme and level		<b>Študijska smer</b> Study field		<b>Letnik</b> Academic year		<b>Semester</b> Semester	
Interdisciplinarni magistrski študijski program Računalništvo in matematika		ni smeri		1 ali 2		prvi ali drugi	
Interdisciplinary Masters study programme Computer Science and Mathematics		none		1 or 2		first or second	
<b>Vrsta predmeta / Course type</b>				izbirni			
<b>Univerzitetna koda predmeta / University course code:</b>				M2409			
<b>Predavanja</b> Lectures	<b>Seminar</b> Seminar	<b>Vaje</b> Tutorial	<b>Klinične vaje</b> work	<b>Druge oblike študija</b>	<b>Samost. delo</b> Individ. work	<b>ECTS</b>	
30	15	30			105	6	
<b>Nosilec predmeta / Lecturer:</b>				prof. Emil Žagar, prof. Gašper Jaklič			
<b>Jeziki / Languages:</b>		<b>Predavanja / Lectures:</b>		slovenski/Slovene, angleški/English			
		<b>Vaje / Tutorial:</b>		slovenski/Slovene, angleški/English			
<b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b>				<b>Prerequisites:</b>			
<b>Vsebina:</b>				<b>Content (Syllabus outline):</b>			
Uvod: de Casteljaouov algoritem, Bernsteinova oblika Bezierove krivulje, Bezierove krivulje				Introduction: de Casteljaou algorithm, Bernstein form of Bezier curve, Bezier curves (general),			

<p>(splošno), zlepki v Bezierovi obliki, racionalne Bezierove krivulje</p> <p>Geometrijska zveznost: geometrijska zveznost krivulj in ploskev, geometrijsko zvezni zlepki</p> <p>Bezierove ploskve: tenzorski produkti, trikotne krpe, racionalne Bezierove ploskve</p> <p>Stožnice: racionalne kvadratne Bezierove krivulje, eksaktna reprezentacija stožnic</p> <p>Krivulje B-zlepkov: lastnosti, algoritmi za delo z B-zlepki</p>	<p>Bezier splines, rational Bezier curves</p> <p>Geometric continuity: geometric continuity of curves and surfaces, geometrically continuous splines</p> <p>Bezier surfaces: tensor products, triangular patches, rational Bezier surfaces</p> <p>Conics: rational quadratic Bezier curves, exact representation of conics</p> <p>B-spline curves: properties, algorithms for manipulating B-spline curves</p>
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### Temeljni literatura in viri / Readings:

<p>G. Farin: Curves and Surfaces for Computer Aided Geometric Design : A Practical Guide, 4th edition, Academic Press, San Diego, 1997.</p> <p>C. de Boor: A Practical Guide to Splines, Springer, New York, 2001.</p> <p>R. H. Bartels, J. C. Beatty, B. A. Barsky: An Introduction to Splines for Use in Computer Graphics and Geometric Modeling: Morgan Kaufmann, Palo Alto, 1996.</p> <p>M.-J. Lai, L. L. Schumaker, Spline functions on triangulations, Cambridge University Press, 2007</p>
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### Cilji in kompetence:

<p>Študent spozna osnove računalniškega oblikovanja. Uporaba Bezierovih krivulj in ploskev, racionalnih Bezierovih krivulj in geometrijsko zveznih zlepkov.</p> <p>V okviru seminarjskih/projektnih aktivnosti študentje z individualnim delom in predstavitevijo ter delom v skupinah pridobijo izobraževalno komunikacijske in socialne kompetence za prenos znanj in za vodenje (strokovnega skupinskega dela).</p>
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### Objectives and competences:

<p>An introduction to computer aided geometric design, use of Bezier curves and surfaces, rational Bezier curves and geometrically smooth splines.</p> <p>With individual presentations and team work interactions within seminar/project activities students acquire communication and social competences for successful team work and knowledge transfer.</p>
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### Predvideni študijski rezultati:

<p>Znanje in razumevanje:</p> <p>Razumevanje osnovnih pojmov krivulj in ploskev. Osnovno znanje programiranja v Matlabu ali Mathematici. Sposobnost</p>
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### Intended learning outcomes:

<p>Knowledge and understanding:</p> <p>Knowledge of basic facts on curves and surfaces. Basic programming skill in Matlab or Mathematica. Skill to implement algorithms in</p>
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<p>implementacije postopkov na računalniku.</p> <p>Uporaba:</p> <p>Uporaba postopkov interpolacije in aproksimacije s polinomi in zlepki pri računalniškem oblikovanju.</p> <p>Refleksija:</p> <p>Razumevanje teorije na podlagi uporabe.</p> <p>Prenosljive spretnosti – niso vezane le na en predmet: Spretnost uporabe teorije v praksi. Sposobnost povezovanja znanj iz numerične matematike, analize in računalništva. Kritično presojanje razlik med teorijo in prakso.</p>	<p>programming language.</p> <p>Application:</p> <p>Application of interpolation and approximation with polynomials and splines in CAGD.</p> <p>Reflection:</p> <p>Understanding theory based on application.</p> <p>Transferable skills:</p> <p>Skill of using theory in practical use. Skill of interconnecting knowledge from numerical mathematics, analysis and computer science. Critical judgement of differences between theory and practical applications.</p>
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**Metode poučevanja in učenja:**

<p>predavanja, vaje, domače naloge, konzultacije</p>
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**Learning and teaching methods:**

<p>Lectures, exercises, homeworks, consultations</p>
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Delež (v %) /

**Načini ocenjevanja:**

Weight (in %)

**Assessment:**

<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt): projekt</p>		<p>Type (examination, oral, coursework, project): project</p>
<p>ustni izpit</p>		<p>oral exam</p>
<p>Ocene: 1-5 (negativno), 6-10 (pozitivno) (po Statutu UL)</p>	<p>50% 50%</p>	<p>Grading: 1-5 (fail), 6-10 (pass) (according to the Statute of UL)</p>

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

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Gašper Jaklič:

– JAKLIČ, Gašper, ŽAGAR, Emil. Planar cubic G [sup] 1 interpolatory splines with small strain energy. Journal of Computational and Applied Mathematics, ISSN 0377-0427. [Print ed.], 2011, vol. 235, iss. 8, str. 2758-2765 [COBISS.SI-ID 15770969]

– JAKLIČ, Gašper, KOZAK, Jernej, KRAJNC, Marjetka, VITRIH, Vito, ŽAGAR, Emil. Hermite geometric interpolation by rational Bézier spatial curves. SIAM journal on numerical analysis, ISSN 0036-1429, 2012, vol. 50, no. 5, str. 2695-2715 [COBISS.SI-ID 16449369]

– JAKLIČ, Gašper, KOZAK, Jernej, KRAJNC, Marjetka, VITRIH, Vito, ŽAGAR, Emil. High order parametric polynomial approximation of conic sections. Constructive approximation, ISSN 0176-4276, 2013, vol. 38, iss. 1, str. 1-18 [COBISS.SI-ID 16716121]

Emil Žagar:

– JAKLIČ, Gašper, ŽAGAR, Emil. Planar cubic G [sup] 1 interpolatory splines with small strain energy. Journal of Computational and Applied Mathematics, ISSN 0377-0427. [Print ed.], 2011, vol. 235, iss. 8, str. 2758-2765 [COBISS.SI-ID 15770969]

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