

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> <b>Study programme and level</b>	<b>Študijska smer</b> <b>Study field</b>		<b>Letnik</b> <b>Academic year</b>		<b>Semester</b> <b>Semester</b>	
Magistrski študijski program Matematika	ni smeri		1 ali 2		prvi ali drugi	
Master's study programme 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> <b>Lectures</b>	<b>Seminar</b> <b>Seminar</b>	<b>Vaje</b> <b>Tutorial</b>	<b>Klinične vaje</b> <b>work</b>	<b>Druge oblike</b> <b>študija</b>	<b>Samost. delo</b> <b>Individ.</b> <b>work</b>	<b>ECTS</b>
30	15	30			105	6
<b>Nosilec predmeta / Lecturer:</b>			prof. dr. Gašper Jaklič, prof. dr. Emil Žagar			
<b>Jeziki /</b> <b>Languages:</b>	<b>Predavanja /</b> <b>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>			

<p>Uvod: de Casteljaouv algoritem, Bernsteinova oblika Bezierove krivulje, Bezierove krivulje (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>Introduction: de Casteljau algorithm, Bernstein form of Bezier curve, Bezier curves (general), 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>
---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

#### **Temeljni literatura in viri / Readings:**

G. Farin: Curves and Surfaces for Computer Aided Geometric Design : A Practical Guide, 4th edition, Academic Press, San Diego, 1997.

C. de Boor: A Practical Guide to Splines, Springer, New York, 2001.

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.

M.-J. Lai, L. L. Schumaker, Spline functions on triangulations, Cambridge University Press, 2007

#### **Cilji in kompetence:**

Študent spozna osnove računalniškega oblikovanja. Uporaba Bezierovih krivulj in ploskev, racionalnih Bezierovih krivulj in geometrijsko zveznih zlepkov.

V okviru seminarskih/projektnih aktivnosti študentje z individualnim delom in predstavitvijo ter delom v skupinah pridobijo izobraževalno komunikacijske in socialne kompetence za prenos znanj in za vodenje (strokovnega skupinskega dela).

#### **Objectives and competences:**

An introduction to computer aided geometric design, use of Bezier curves and surfaces, rational Bezier curves and geometrically smooth splines.

With individual presentations and team work interactions within seminar/project activities students acquire communication and social competences for successful team work and knowledge transfer.

#### **Predvideni študijski rezultati:**

#### **Intended learning outcomes:**

**Znanje in razumevanje:**

Razumevanje osnovnih pojmov krivulj in ploskev. Osnovno znanje programiranja v Matlabu ali Mathematici. Sposobnost implementacije postopkov na računalniku.

**Uporaba:**

Uporaba postopkov interpolacije in aproksimacije s polinomi in zlepki pri računalniškem oblikovanju.

**Refleksija:**

Razumevanje teorije na podlagi uporabe.

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.

**Knowledge and understanding:**

Knowledge of basic facts on curves and surfaces. Basic programming skill in Matlab or Mathematica. Skill to implement algorithms in programming language.

**Application:**

Application of interpolation and approximation with polynomials and splines in CAGD.

**Reflection:**

Understanding theory based on application.

**Transferable skills:**

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.

**Metode poučevanja in učenja:**

predavanja, vaje, domače naloge, konzultacije

**Learning and teaching methods:**

Lectures, exercises, homeworks, consultations

<b>Načini ocenjevanja:</b>	<b>Delež (v %) / Weight (in %)</b>	<b>Assessment:</b>
Način (pisni izpit, ustno izpraševanje, naloge, projekt):	50% 50%	Type (examination, oral, coursework, project):

<p>projekt</p> <p>ustni izpit</p> <p>Ocene: 1-5 (negativno), 6-10 (pozitivno) (po Statutu UL)</p>		<p>project</p> <p>oral exam</p> <p>Grading: 1-5 (fail), 6-10 (pass) (according to the Statute of UL)</p>
-------------------------------------------------------------------------------------------------------	--	--------------------------------------------------------------------------------------------------------------

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

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]

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, ŽAGAR, Emil. Planar cubic  $G^1$  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]