

UČNI NAČRT PREDMETA / COURSE SYLLABUS (leto / year 2017/18)						
Predmet:		Računalniško podprto (geometrijsko) oblikovanje				
Course title:		Computer aided (geometric) design				
Študijski program in stopnja Study programme and level		Študijska smer Study field		Letnik Academic year	Semester Semester	
Magistrski študijski program Matematika		ni smeri		1 ali 2	prvi ali drugi	
Master's study programme Mathematics		none		1 or 2	first or second	
Vrsta predmeta / Course type				izbirni / elective		
Univerzitetna koda predmeta / University course code:				M2409		
Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30	15	30			105	6
Nosilec predmeta / Lecturer:		prof. dr. Gašper Jaklič, prof. dr. Emil Žagar				
Jeziki / Languages:		Predavanja / Lectures: slovenski / Slovene, angleški / English				
		Vaje / Tutorial: slovenski / Slovene, angleški / English				
Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:			Prerequisites:			
Vpis v letnik študija.			Enrolment in the programme.			
Vsebina:			Content (Syllabus outline):			

<p>Uvod: de Casteljauov 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>
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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 seminarских/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

Načini ocenjevanja:

Delež (v %) /

Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt):

50%

Type (examination, oral, coursework, project):

projekt

50%

project

ustni izpit

oral exam

Ocene: 1-5 (negativno), 6-10 (pozitivno) (po Statutu UL)

Grading: 1-5 (fail), 6-10 (pass) (according to the Statute of UL)

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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]