

Specification for the book of courses

Study program		Electrical Engineering and Computer Science		
Module		Computing and Informatics		
Type and level of studies		Undergraduate Academic Studies		
The name of the course		Geometric methods with applications		
Lecturer (for lectures)		Džunić S. Jovana		
Lecturer/associate (for exercises)		Stankov D. Stefan		
Lecturer/associate (for OFE)				
Number of ECTS	3	Course status (obligatory/elective)	Elective	
Prerequisites				
Course objectives	Mastering tools of Calculus3D, Numerical mathematics and analysis suitable for use in computer graphics and machine learning.			
Course outcomes	Foundation for a wide variety of applications in data science, computer graphics and machine learning.			
Course outline				
Theoretical teaching	Types of Errors, accuracy, precision, conditioning and stability. Iterations. Univariate calculus: Function Approximation and data fitting using algebraic polynomials. Geometry of 3D: vector product and applications. Calculus in 3D: conic sections, curves, parametrized curves, regular curves. Calculus of vector valued functions. Linear and affine functions. Convex functions. Level curves and surfaces. Surfaces and tangent planes. Extrema. Approximation in 2D and 3D and applications. Multivariable interpolation: Nearest-Neighbor Interpolation. Barycentric Interpolation. Grid-Based Interpolation. Linear algebra of functions. Approximation via Piecewise Polynomials. Applications to root-finding, numerical differentiation and integration.			
Practical teaching (exercises, OFE, study and research)	Excercises in computing.			
Textbooks/references				
1	J. Džunić, e-book: Geometric methods and applications (in Serbian)			
2	Z. Nitecki, Calculus in 3D: Geometry, Vectors, and Multivariate Calculus, Numerical Mathematical Society, 2018			
3	J. Solomon, Numerical Algorithms: Methods for Computer Vision, Machine Learning and Graphics, CRC Press, 2015			
4	A. Öchsner, M. Merkel, One dimensional finite element, Springer, 2018			
5	T. Hughes, The finite element method, Dover Publications, 2012			
Number of classes of active education per week during semester/trimester/year				
Lectures	Exercises	OFE	Study and research work	Other classes
2	1	0	0	0
Teaching methods	Lectures, exercises in computing, projects.			
Grade (maximum number of points 100)				
Pre-exam duties	Points	Final exam		Points
Activity during lectures		Written exam		30
Exercises		Oral exam		30
Colloquia				
Projects	40			