

Software Engineering Institute			Semester 3. of the curriculum 2026-27-1			
Name of the subject:	Code of the subject:	Credits:	Weekly hours:			
				lec	sem	lab
Engineering computational methods	NSXMS1EMNF	5	full-time	2	0	2
Responsible person for the subject: Prof. Dr. GALÁNTAI Aurél			Classification: professor emeritus			
Subject lecturer(s): Dr. Károly Szilák						
Prerequisites:	NMXDE1EMNF	Differential equations				
Way of the assessment:	exam					
Course description						
Goal:	Study of numerical methods for differential equations.					
Course description:	Solution of linear and nonlinear system of equations. Methods for ODE IVP and BVP. Their programming, convergence and stability. Discretizations of PDE. Variational methods. Ritz and Galerkin methods. FEM. Matlab programming and Matlab programs.					

Lecture schedule	
Education week	Topic
1.	The elements of Matlab
2.	Direct solution methods of linear systems 1
3.	Direct solution methods of linear systems 2
4.	Solution methods of nonlinear equations
5.	Discretization methods of ODE IVPs 1
6.	Discretization methods of ODE IVPs 2
7.	Discretization methods of ODE BVPs 1
8.	Discretization methods of ODE BVPs 2
9.	Solution methods for PDEs 1
10.	Solution methods for PDEs 2
11.	Solution methods for PDEs 3
12.	Solution methods for PDEs 4
13.	Matlab ODE programs
14.	Examples

Mid-term requirements	
Conditions for obtaining a mid-term grade/signature	Solving a minimum of 40% of the individual test problems given during the semester.

Assessment schedule	
Education week	Topic

Method used to calculate the <i>mid-term grade</i> (to be filled out only for subjects with mid-term grades)

Type of the replacement	
Type of the replacement of written test/mid-term grade/signature	Submission of the individual test problems can be repeated during the first 10 days of the examination period.

Type of the exam (to be filled out only for subjects with exams)	
Written and oral exam.	
Calculation of the exam mark (to be filled only for subjects with exams)	
The assessment is based on the performance at the written and oral exam.	
Final grade calculation methods:	
References	
Obligatory:	A. Galántai A.: Engineering Computational Methods 1 2014/2015 spring semester (lecture notes)
Recommended:	U.M. Ascher, R.M.M. Mattheij, R.D. Russell, Numerical Solution of Boundary Value Problems for Ordinary Differential Equations, SIAM, 1995 S.C. Brenner, L. Ridgway Scott, The Mathematical Theory of Finite Element Methods, 3rd ed., Springer, 2008 C.G. Broyden, M.T. Vespucci, Krylov Solvers for Linear Algebraic Systems, Elsevier, 2004
Other references:	