ÓBUDA UNIVERSITY
JOHN VON NEUMANN FACULTY OF INFORMATICS

Institute of Applied Mathematics			Semester 1. of the curriculum 2026-27-1			
Name of the subject:	Code of the subject:	Credits:	Weekly hours:			
				lec	sem	lab
Discrete mathematics	NMXDM1EMNF	4	full-time	2	1	0
Responsible person for the subject: Dr. HEGEDÜS Gábor			Classification: associate professor			
Subject lecturer(s):						
Prerequisites:						
Way of the assessment:	exam					

Course description	
Goal:	Developing the student's conceptualization, abstraction, and problem-solving abilities by learning about the basic topics of discrete mathematics, as well as their applications in problem solving and model creation. The basic concepts of graph algorithms and complexity theory are learned from the theory of algorithms.
Course description:	Principle of mathematical induction, pigeonhole principle, principle of inclusion and exclusion. Permutations, variations and combinations, binomial theorem. Generating functions and their basic properties. Linear recurrence relations, Stirling, Catalan, Bell and Fibonacci sequences. The basic properties of graphs, subgraphs, complements and graph isomorphism. Trees, forests, Prüfer code, Euler trails and circuits, Hamilton paths and cycles, Ore's theorem, Posa's theorem, extreme graph theory, Turán's theorem. Graph colouring, Brooks' theorem, Vizing's theorem, perfect graphs, planar graphs, dual graphs, Kuratowski's theorem. Matching theory, Hall's theorem, König's theorem, Gallai's theorem, Hungarian method, flows, max-flow min-cut theorem.

Lecture schedule	
Education week	Topic
1.	Principle of mathematical induction, pigeonhole principle, principle of inclusion and exclusion
2.	Permutations, variations and combinations, binomial theorem
3.	Generating functions and their basic properties
4.	Linear recurrence relations
5.	Stirling, Catalan, Bell and Fibonacci sequences
6.	First midterm test
7.	The basic properties of graphs, subgraphs, complements and graph isomorphism
8.	Trees, forests, Prüfer code
9.	Euler trails and circuits, Hamilton path and cycles, Ore's theorem, Posa's theorem, extreme graph theory, Turán's theorem
10.	Vertex colouring, Brooks' theorem, Vizing's theorem
11.	Perfect graphs, planar graphs, dual graphs, Kuratowski's theorem
12.	Matching theory, Hall's theorem, König's theorem, Gallai's theorem, Hungarian method, flows, max-flow min-cut theorem
13.	Second midterm test
14.	Test retake

Mid-term requirements	
Conditions for obtaining a mid-term grade/signature	The student obtains the signature only if they have written both midterm test and reach at least 50% of the scores. The midterm tests consist of theoretical questions and exercises from the material of the lectures and

	classes. It is compulsory to attend the lectures and classes, the absence may not exceed 30% of the lectures.

Assessment schedule	
Education week	Topic
6.	Material of weeks 1 to 5
13.	Material of weeks 7 to 12
14.	One of the midterms

Method used to calculate the *mid-term grade* (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	Test retake in the last week of the lecture period, signature retake exam in the first 10 days of the examination period

Type of the exam (to be filled out only for subjects with exams)

Written exam

Calculation of the exam mark (to be filled only for subjects with exams)

50% for theoretical questions and 50% for exercises

Final grade calculation methods:

Total points	**Colloquium grade**
86–100	excellent (5)
74–85	good (4)
62–73	satisfactory (3)
50–61	pass (2)
0–49	fail (1)

References	
Obligatory:	Materials uploaded to the e-learning system of the university
Recommended:	Graham, Ronald L., Donald E. Knuth, and Oren Patashnik: *Concrete Mathematics*, Massachusetts: Addison-Wesley Grimaldi, Ralph P.: *Discrete and Combinatorial Mathematics, 5/e*. Pearson Education India, 2003.
Other references:	