

Course name : <b>Discrete Mathematics</b>		
Type of study: <b>Mathematics/Informatics</b>	Type of study: <b>Full-time</b>	Examination: <b>Assignment</b>
Course characteristics: <b>Compulsory</b>	Level: <b>Second (M.Sc.)</b>	Year: <b>Full year</b>
Type of classes: <b>lectures, tutorials</b>	Hours per week: <b>2 lect, 2 tut</b>	ECTS points: <b>4 ECTS</b>

## COURSE GUIDE

### AIMS

- A1. Making the students familiar with basic problems of discrete mathematics both from the theoretical and computational methods.
- A2. Acquainting the students with practical skills of solving discrete mathematics problems, interpreting technical terms, including information technology with the use relations, ability to apply graph theory and recursion to solve application problems, in particular, to analyze network problems.

### PREREQUISITES

1. Course of linear algebra.
2. Course of logic.
3. Course of the calculus of one variable
4. Ability to use different sources of information.
5. Ability to work independently and in a group.
6. Ability to correctly interpret and present their own activities.

### LEARNING OUTCOMES

- EE 1 – Student is familiar with mathematical induction and recursion.
- EE 2 – Student is able to use divisibility properties and congruence relation.
- EE 3 – Student is able to construct the graph and determine its properties.
- EE4 – Student is familiar with the basic issues of coding and automata.

### CONTENT

<b>Lectures</b>	<b>Hours</b>
Lect. 1 – Set theory. Inclusion-exclusion principle. Pigeonhole principle.	<b>2</b>
Lect. 2 – Mathematical induction.	<b>2</b>
Lect. 3 – Recurrence.	<b>2</b>
Lect. 4, Lect. 5 – Combinatorics.	<b>4</b>
Lect. 6, Lect. 7 – Number theory.	<b>4</b>
Lect. 8 – Theory of relations.	<b>2</b>
Lect. 9 – Modular arithmetic.	<b>2</b>
Lect. 10 – Basic terms of graph theory.	<b>2</b>
Lect. 11 – Euler cycle. Hamiltonian cycle.	<b>2</b>
Lect. 12 – Trees.	<b>2</b>

Lect. 13 – Weighted graph. The shortest path problem.	2
Lect. 14 – Code theory.	2
Lect. 15 – Automata.	2
<b>TUTORIALS</b>	Hours
Tut. 1 – Operations on sets. Inclusion-exclusion principle.	2
Tut. 2 - Mathematical induction.	2
Tut. 3 – Recurrence. Fibonacci numbers. Golden ratio.	2
Tut. 4, Tut. 5 – Combinatorics.	4
Tut. 6, Tut. 7 – Divisibility of integers. The greatest common divisor. The Euclidean algorithm. The least common multiple. Primes.	4
Tut. 8 – Test	2
Tut. 9 – Properties of relations.	2
Tut. 10 – Modular arithmetic.	2
Tut. 11 – Properties of graphs. Directed and undirected graph. Isomorphism invariants.	2
Tut. 12 – Euler cycle. Hamiltonian cycle.	2
Tut. 13 – Weighted graph. The shortest path problem.	2
Tut. 14 – Trees. Huffman coding.	2
Tut. 15 – Test.	2

### TEACHING TOOLS

1. Lectures with multimedia presentations
2. Blackboard and chalk or whiteboards and markers
3. Literature

### LITERATURE

Lecture notes.
N.L.Biggs, Discrete mathematics, Oxford University Press, 1989.
L.Lovász, K. Vesztergombi, Lecture Notes, Yale University, 1999.
K.A.Ross, C.R.B. Wright, Discrete mathematics, Pearson, 2002.
S. Epp, Discrete Mathematics with Applications, Brooks Cole, 2010.

### TEACHERS

1. <b>prof. Zbigniew Domański</b> - zbigniew.domanski@im.pcz.pl
2. <b>dr. Jolanta Pozorska</b> – jolanta.pozorska@im.pcz.pl

### ADDITIONAL NOTES

Links to course unit teaching materials can be found on the <http://www.pcz.pl/english/ects-subjects> website for current students.