



Introduction to informatics

Piroska Biró

Labor 01

Contact & Office Hours

- ▶ Office Hours
 - Monday 9–10 am
 - Wednesday 4–5 pm
- ▶ Office: I-227

- ▶ E-mail:
 - biro.piroska@inf.unideb.hu
- ▶ Course material (Class Webpage):
 - <https://w1.inf.unideb.hu/web/biropiroska/introduction-to-infomatics/>

Syllabus

- ▶ **Types of course:** Theory/Labor
- ▶ **Course number/week:** 2+2
- ▶ **Subject code:** INGK201–K5
- ▶ **Credit:** 5

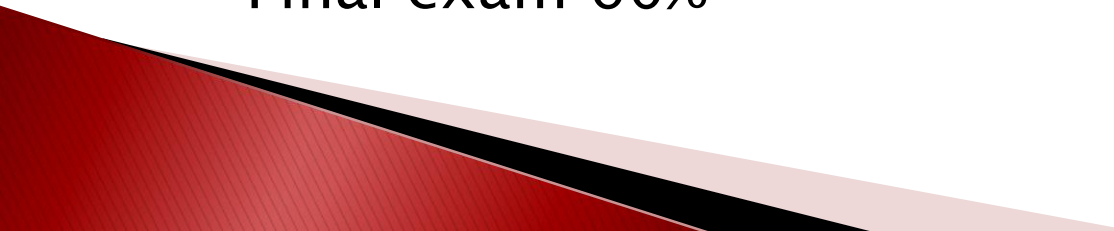
- ▶ **Theory:** Wednesday 8–10, F01
- ▶ **Labors:**
 - Wednesday 10–12, 108
 - Wednesday 12–14, 108

Requirements

▶ Attendance and Participation:

- In every course and labor there will be an attendance sheet.
- Maximum three absences are allowed in labor.
- Maximum 15 minutes late arrival is accepted in labor.

▶ Assessment and grading:

- Midterm 20%
 - End-term 20%
 - Final exam 60%
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16th	September	Introduction, Test, Basic concepts, History of computing
24th	September	Computer number systems, Conversion rules, Arithmetic operations in different number systems
1st	October	Data storage
8th	October	Boole–algebra, Logical operations, Logical gates
15th	October	Operating Systems
22th	October	Professional Week – No class
29th	October	Networking and the Internet
5th	November	Midterm 1
12th	November	Algorithms
19th	November	C programming language Data types, Operators, Statements, Loops
26th	November	Basic algorithms, Functions
3rd	December	Arrays and strings, Pointers
10th	December	Iterative, Recursive, Induction
17th	December	End–term 2

Number systems

- ▶ Decimal number system
 - the concept of place value
- ▶ Generally the numbers can be described in the following form:

$$a_n a_{n-1} \dots a_1 a_0 a_{-1} a_{-2} \dots a_{-m}$$
$$\sum_{i=-m}^n a_i \cdot 10^i, \text{ when } 0 \leq a_i < 10.$$

- ▶ Optional in the p base ($p > 1$) number system the used digits $0, 1, \dots, p-1$, the place values are the powers of number p :

$$\sum_{i=-m}^n a_i \cdot p^i, \text{ when } 0 \leq a_i < p.$$

For example: 123,45



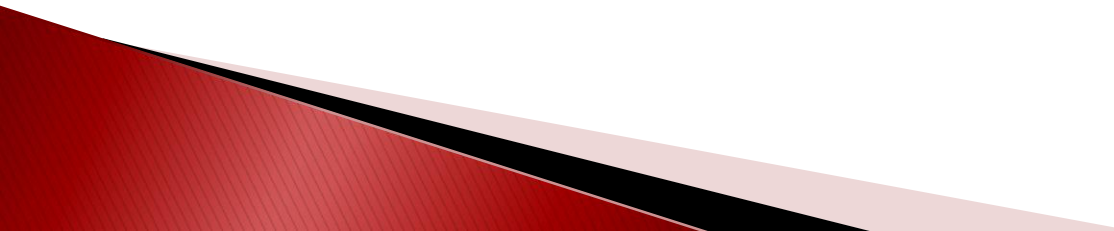
Number systems

- ▶ Binary (base two) number system
 - digits: 0, 1
- ▶ Ternary (base three) number system
 - digits: 0, 1, 2
- ...
- ▶ Octonary (base eight) number system
 - digits: 0, 1, 2,..., 7
- ...
- ▶ Decimal (base ten) number system/ten base
 - digits: 0, 1, 2,..., 9
- ...
- ▶ Hexadecimal (base sixteen) number system
 - digits: 0, 1, 2, ..., 9, A, B, C, D, E, F

Binary p = 2	Ternary p = 3	Quinary p = 5	Octonary p = 8	Decimal p = 10	Duodecimal p = 12	Hexadecimal p = 16
0	0	0	0	0	0	0
1	1	1	1	1	1	1
10	2	2	2	2	2	2
11	10	3	3	3	3	3
100	11	4	4	4	4	4
101	12	10	5	5	5	5
110	20	11	6	6	6	6
111	21	12	7	7	7	7
1000	22	13	10	8	8	8
1001	100	14	11	9	9	9
1010	101	20	12	10	a	A
1011	102	21	13	11	b	B
1100	110	22	14	12	10	C
1101	111	23	15	13	11	D
1110	112	24	16	14	12	E
1111	120	25	17	15	13	F
10000	121	26	20	16	14	10



Number systems base names

- 2 binary
 - 3 ternary
 - 4 quaternary
 - 5 quinary
 - 6 senary
 - 7 septenary
 - 8 octonary
 - 9 nonary
 - 10 decimal
 - 11 undenary
 - 12 duodecimal
 - 13 tridecimal
 - 14 quattuordecimal
 - 15 quindecimal
 - 16 sexadecimal
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Exercise

- ▶ Convert each of the following different base representation to its equivalent base ten form:

1. $1011100.101_2 =$

2. $1221.12_3 =$

3. $152.43_6 =$

4. $173.104_8 =$

5. $841.47_9 =$

6. $13A.2F_{16} =$



Convert from base ten to different base number representations

$113.45_{(10)}$

113	2
56	1
28	0
14	0
7	0
3	1
1	1
0	1



0	.45	2
0	.90	
1	.8	
1	.6	
1	.2	
0	.4	
0	.8	
1	.6	
1	.2	
0	.4	
0	.8	

$1100001.0111001100_{(2)}$



Exercise

- ▶ Convert each of the following base ten representation to its equivalent binary form:

1. $962_{10} =$
2. $3241_{10} =$
3. $871,64_{10} =$
4. $1322,181_{10} =$

- ▶ Convert each of the following ten base representation to its equivalent octonary form:

1. $51_{10} =$
2. $718_{10} =$
3. $417,18_{10} =$
4. $791,27_{10} =$

- ▶ Convert each of the following ten base representation to its equivalent hexadecimal form:

1. $334_{10} =$
2. $8191_{10} =$
3. $218,2_{10} =$
4. $245,17_{10} =$



Connection between the octal and the binary system

Binary	Octal
000	0
001	1
010	2
011	3
100	4
101	5
110	6
111	7



Connection between the hexadecimal and the binary system

Binary	Hexadecimal	Binary	Hexadecimal
0000	0	1000	8
0001	1	1001	9
0010	2	1010	A
0011	3	1011	B
0100	4	1100	C
0101	5	1101	D
0110	6	1110	E
0111	7	1111	F



Exercise

- ▶ Convert each of the following binary representation to its equivalent octal and hexadecimal form, and each of the following hexadecimal representation to its equivalent binary and octal form:

1. $1110\ 1001\ 1100\ 0011_2 =$

2. $1011\ 0111\ 0101\ 0100_2 =$

3. $1000\ 1101\ 1111\ 0011\ 1101_2 =$

4. $1010\ 1011\ 0011\ 1110\ 0001\ 0101_2 =$

5. $3BCF_{16} =$

6. $BF29_{16} =$

7. $48C5_{16} =$

8. $63AE_{16} =$



Exercise

- ▶ Convert each of the following ten base representation to its equivalent binary form:

1. $1862_{10} =$

2. $93281_{10} =$

3. $39871,64_{10} =$

4. $49322,1813_{10} =$

- ▶ Convert each of the following ten base representation to its equivalent base seven (septenary) form:

1. $1951_{10} =$

2. $82718_{10} =$

3. $417,18_{10} =$

4. $13791,27_{10} =$

- ▶ Convert each of the following ten base representation to its equivalent base nine (nonary) form:

1. $2334_{10} =$

2. $83191_{10} =$

3. $218,92_{10} =$

4. $5245,67_{10} =$



Webpages – Practicing – Converters

- ▶ http://courses.cs.vt.edu/~cs1104/number_conversion/conv2.html
- ▶ <http://www.easysurf.cc/cnver18.html>
- ▶ <http://planetcalc.com/862/>

