



Computer Systems, Data Structures, and Data Management

An Introduction to Numbers and Number Systems

Vassilis Markos, Mediterranean College, Fall 2024 – 2025

Week 01

Contents



- 1 A Brief Intro
- 2 Number Systems
- 3 Fun Time!

A Brief Intro

Desperate Times, Desperate Measures

Since we are transitioning on a new platform, things are still a bit quirky. So, to make sure we keep track of who is here and who is not, please **scan the QR code shown next** or **click the link below it** and fill in this form with your information (confidential).



<https://forms.gle/epCXsHgiTpyWqjR36>

Desperate Times, Desperate Measures

For similar reasons, we will also be using a public shared drive folder to keep our materials as long as our platform is a bit unstable. To visit the platform and download this lecture's materials please use the QR shown right or the link below.



<https://drive.google.com/drive/folders/1Jqni3PkT-5q9ezHh0MYmr45Jvau7LvcR?usp=sharing>

Some More Technicalities



- Inside computer labs **we are not allowed to eat or drink** (coffee included), **with the exception of water.**
- **Do not try to disassemble any part of the lab equipment!** It might well do so by itself, if needed!
- Attendance will be checked **every hour**:
 - Classes start at xx:00 and end at xx:50.
 - You can enter class with a 10 minutes delay.
 - You can also enter class after that allowed 10 minutes delay, but, in this case, you will have been marked as absent.
 - In case of scheduled absence, please inform me prior to our class via email or in person.

sudo echo whoami



- Vassilis (name) Markos (surname): it also works the other way around.
- My interests include: AI / XAI, Quantum Computing, Data Science, Operator Theory, Statistics, Software Development... (this might be of your interest too in the future, in case you are looking for a **thesis supervisor**).
- I am mostly a Linux / UNIX user, so, please, be kind towards my ignorance regarding MS Windows. :)

What Is This Course?



What is this course about?

- a Data Structures.
- b Algorithms about important problems, e.g., sorting a list of items in the quickest possible way.
- c A brief intro to C — just for demonstration purposes.
- d A brief intro to Databases.

We will also use Python alongside C in cases we do not care that much about memory management but, mostly, about higher level concepts.

Module(s) Assessment



All coursework will be submitted **directly on UDO** (you will get your credentials soon if you have not yet). This means that:

- Delayed submissions are not possible (including submissions by email etc).
- The only way to get an extension is by formally applying for one **at the University of Derby**.
- All UDO submissions are by default checked by Turnitin.

Module(s) Assessment



So, in order for things to run smoothly:

- You should **work** on coursework sufficiently **prior to the deadline!**
- In case of extension, **make sure you have all necessary documents** available, e.g., doctor's written diagnosis, in case of a medical condition.
- I will be accepting **drafts** which can be discussed during **office hours** to make sure things are okay for submission.
- Do not make (excessive) use of Generative AI!

Module's Coursework



There is a two-part coursework for this course:

- **Coursework 1 (50%):** A portfolio of lab exercises showcasing use of data structures and algorithms we have studied.
- **Coursework 2 (50%):** Design and analysis of a data engineering solution such as a database (table, structure, formats) for a given scenario.

Number Systems

Number Systems



Please visit:

- `number-systems-01.pdf`
- `computer-number-01.pdf`

Useful Resources



Some resources relevant to our course:

- Usually quite in depth and informative tutorials can be found at: <https://realpython.com/>. I highly recommend this as a source for your personal learning, as we will use Python in this course.
- Some interesting free online books about algorithms and data structures in C:
<https://github.com/GauravWalia19/Free-Algorithms-Books/tree/main/Library/src/C>
- An extensive tutorial on Python data structures:
<https://realpython.com/python-data-structures/>

Fun Time!

In-class Exercise #001



Convert the following numbers from decimal to binary, hex, and octal number systems:

- 64
- 12
- 401
- 31

In-class Exercise #002



Convert the following numbers from binary to decimal:

- 110111
- 100100
- 111111
- 101010

In-class Exercise #003



Convert the following numbers from hex to decimal and binary:

- 645A
- ABCD
- F108
- 4210

Homework



- ① Are there numbers which have the same representation in both decimal and binary systems? For instance, 5 in decimal is 101 in binary, so, this number has different representation in those two systems.
- ② The **ternary system** is a number system of base 3, i.e., we have at our disposal only digits 0, 1, and 2.
 - Can you describe an algorithm for converting a number from decimal to ternary?
 - Can you describe an algorithm for converting a number from ternary to decimal?

Share your solutions via email at: `v.markos@mc-class.gr`.

Any Questions?

Do not forget to fill in
the questionnaire shown
right!



<https://forms.gle/vpuxau789HcsGF7d8>