Presentation guide for unit 1
Introduction to Computers

The aim of this unit is to give an introduction to the concept of computer. A computer is a machine designed to process information, which manipulates a set of input data through a series of machine instructions. In this unit the following concepts are presented:

- First, the concepts of technology, structure and architecture of a computer are reviewed. Technology focuses on how the components of a computer are built, structure deals with the components and their organization. Finally, the architecture of a computer defines those attributes that are visible to a programmer: the set of instructions, the type and format of data the computer is capable of using, the number and size of the registers, the input/output techniques and mechanisms, and memory addressing techniques. This course deals with the study of these two levels: structure and architecture of a computer.
- A brief review is made of the main technological aspects with which computers are built, starting with the concept of transistor and seeing how logic gates are built using transistors. Next, the concept of the combinational system is reviewed, a digital system whose output depends on the input values, and the sequential system, where the output depends on the input values and the current state of the system. These are, therefore, elements that store state.
- Once the elements won computers are built, a description of the Von Neumann computer is made, which is the computer model that is described throughout the course. The Von Neumann computer model is based on the concept of a stored program. In a Von Neumann architecture there is a processor capable of executing instructions and a memory where the programs and the data that these programs manipulate are stored. In a computer of this type, the program to be executed must be previously loaded into memory. The different elements that make up a Von Neumann architecture are described very briefly.
- The concept of a program is introduced, as a consecutive sequence of machine instructions and the steps necessary to be able to execute a program are described. It also describes what a machine instruction is and how it is formatted.
- An important aspect that will be addressed throughout the course is how programs run on a computer. To this end, the phases of execution of an instruction are presented in this unit: reading the main memory instruction, decoding and execution of the instruction. In the material provided is presented a hypothetical set of instructions and an animation that describes the process that the processor performs to execute the instructions that are part of a program.
- Some characteristic parameters of a computer are described. It describes the concept of word, the different privileged sizes with which a computer works, the main units used to express the size of the memories, latency, bandwidth, and terms such as MIPS (millions of instructions per second) and MFLOPS (millions of floating point operations per second)
- The unit ends with a series of web links that can be used to study the historical evolution that computers have undergon.

Material

As material associated with this unit is included the theory material and a collection of exercises proposed and resolved on the aspects covered in the subject.

Recommended bibliography

- "Problemas resueltos de estructuras de computadores" (GARCIA CARBALLEIRA, Félix et al.).
- "Computer organization and design. The hardware/software interface" (PATTERSON, David, et al).
- "Computer Organization and Architecture" (STALLINGS, William).
- "Fundamentals of digital systems" (FLOYD, Thomas L.).