Presentation guide for unit 2
Data Representation

This unit presents and describes the different schemes used to represent different types of information in a computer. All the information that is stored in a computer is in binary format. Therefore, firstly, a review of positional representation systems and binary and hexadecimal representation is made. Once this review is done, the unit is dedicated to analysis:

- The representations of letters and character strings in a computer. There are different schemes to encode characters (ASCII, EBCDIC, etc) and different schemes used to represent strings of characters in the memory of a computer.
- Representations of natural numbers. It describes the representation of numbers in the binary system and analyzes its representation range, which describes the interval between the lowest and highest representable number depending on the number of bits used to represent the number.
- Representation of numbers with sign. Different schemes to represent signed numbers are described
    - Sign-magnitud.
    - One's complement.
    - Two's complement.
- Arithmetic of numbers in one's complmenet and two's complement. It is described how the addition and subtraction of numbers represented in these schemes is done
- Representation of floating point numbers. This type of representation is used to represent real numbers in the computer. Specifically, the IEEE 754 standard is presented, which is the standard used in most computers to represent floating point numbers. The different formats that exist are presented: simple precision, double precision and quadruple precision. It is also described how the representation of numbers is done in this standard.
- Arithmetic of floating point numbers. It is presented how floating point units perform addition, subtraction, multiplication and division operations and how the rounding process of these numbers is performed. It is also studied some problems that this type of representation presents, problems of associativity in the realization of operations and conversion between integers and real numbers

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.).