

Numerical Systems:

- Binary (Base 2)
- Ternary (Base 3)
- Octa (Base 8)
- Decimal (Base 10)
- Hexa (Base 16)

Converting between Systems:

- binary \rightarrow decimal (represent the number using powers $2^0 + 2^1 + 2^2 + \dots$)
- decimal \rightarrow binary (divide by 2 and get the remainder)
- hex \rightarrow binary (replace each value with binary representation)
- binary \rightarrow hex (group every four bits and write their representation)
- decimal \rightarrow hex (divide by 16 and take the remainder)
- hex \rightarrow decimal (represent the number using powers $16^0 + 16^1 + 16^2$)

Computer Memory:

- bits, bytes, kb, mb, gb, tb
- powers of two
- logarithms
- Some important rules:
 - $2^{(n+m)} = 2^n \times 2^m$ (num_of_address_bits \rightarrow max_size_of_memory)
 - $\log(nxm) = \log n + \log m$ (memory_size \rightarrow required_number_of_bits_in_address)

Data Representation:

- Text (ASCII)
- Numbers:
 - unsigned integers: (direct representation i.e binary value)
 - signed integers: (2s complement)
 - Float numbers: (IEEE floating point representation)
- Images (pixels, RGB)
- Sound (Sampling, HZ)

- Video (images and Sounds represented as frames (fps))

C Language:

- DataTypes:
 - Integers:
 - char, unsigned char (%c)
 - int, unsigned int (%d)
 - short, unsigned short (%h)
 - long, unsigned long (%l)
 - Float:
 - float (%f)
 - double (%lf)
 - long double (%Lf)
 - void
 - Other types:
 - pointers (%p)
 - arrays
 - struct
 - union
 - function
- Main instructions:
 - printf, scanf, arithmetic, comparison, logical,
 - bitwise operators: ~, &, |, ^, >>, <<
- Variables:
 - Local vs Global
- Arrays:
 - is a sequence of values in the memory.
 - No bound check.
 - static array vs dynamic array.
 - you should follow: size, capacity

- String:
 - array of characters
- Pointers and Memory Allocation:
 - define a pointer.
 - Make the pointer mention to an existing variable
 - Or allocate memory for the pointer: malloc
 - free the memory
 - null value
- Struct: LinkedList, Tree.
- Multiple files (.h , .c)
- Files:
 - Text files (r, w, a), fgets, putc, fscanf, fprintf
 - Binary files (rb, wb, ab) fread, fwrite
- Basic Architecture:
 - Relation between Memory and CPU.
 - Bus system: Data, Control, Address.
 - Cache Memory.
 - CPU Cycle: IF, ID, IE, WM, RM
 - CPU Registers: 8bits, 16bits, 32bits, 64bit, etc