CDA 3103 Fundamentals of Computer Systems

Credits: 3


Prerequisite: COP 2210 or equivalent.

Course outline: (number of lectures shown in parentheses)

- Virtual machine concept (0.5)
- Data representation (1.5)
  - signed and unsigned binary integers
  - binary and hexadecimal arithmetic
  - character representation
  - floating-point binary representation
- Boolean and digital logic (3)
  - simple boolean operations
  - boolean functions and truth tables
  - transistors and digital gates
  - multiplexers and decoders
  - D-latches
  - registers
- Instruction set architecture (5)
  - machine language
    - instruction format
    - operands, opcodes
    - addressing modes
  - data path, instruction execution cycle
  - memory allocation and management
  - memory read cycle
  - registers and flags
  - microcomputer components
  - memory types
  - pipelining and superscalar concepts
  - input-output system
  - interrupts and traps
- Basic elements of assembly language (4)
  - assembling, linking, and running programs
  - defining data and constants
  - data transfer instructions
  - addition and subtraction
  - status flag usage
  - counting loops
  - addressing modes
  - indirect addressing
  - declaring and calling procedures
- Stack frames (3)
  - basic stack operations
  - local variables
• stack parameters
• recursive functions

• Conditional processing (2)
  • boolean and comparison instructions
  • conditional jumps
  • IF and WHILE programming patterns

• Advanced arithmetic (2)
  • bit shifting and rotation
  • multiplication and division algorithms
  • extended precision arithmetic
  • multiplication and division instructions
  • generating code from arithmetic expressions

• Assembling and linking (3)
  • introduction to macros
  • two-pass assembly details
  • linking and loading

Optional Topics (3)

• constructing and verifying error-correcting codes
• macro programming
• array manipulation
• parsing text with finite-state machines
• keyboard input
• video programming