CDA 3103 Fundamentals of Computer Systems

Credits: 3

Syllabus: Overview of computer systems organization. Data representation. Boolean and digital logic. Instruction set architecture. Assembly language.

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 arihmetic
    - 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