

# CDA 3103 Fundamentals of Computer Systems

## Data Representation (Chapter 2)

- Decimal, Binary and Hexadecimal Numbers; converting between number-bases.
- Signed and Unsigned Integer types: Sign-Magnitude, 1's Complement and 2's Complement; Unsigned and Signed Overflow; Zero-extension and Sign-extension.
- Fixed Point and Floating Point Real; IEEE Short Real and IEEE Long Real representations.
- 7-Bit ASCII Character representation; Character Strings.
- Boolean Type; Bitwise operators: **not**, **and**, **or**, **xor**.

## Digital Logic Fundamentals (Chapter 3)

- CMOS Transistors: N-type and P-type.
- Logic Gates: NOT, AND, OR, NAND, NOR; De Morgan's Laws; Multiple-input gates.
- Combinational Circuit implementation: 2-Level AND-OR; PLA's.
- Combinational Circuits: Decoder, Multiplexer, Adders.
- Memory Circuits: SR-Latch, D-Latch, Registers, RAM.
- Finite State Machines (overview only).

## Computer Architecture (Chapters 4, 5, 9)

- The von Neumann Model: major components and Special Purpose registers.
- Machine Language Instructions; Instruction Cycle; Data Path.
- The LC-3 ISA: Memory, General Purpose Registers, Instruction Categories.
- LC-3 *Operate* Instructions: NOT, AND, ADD; Arithmetic and Logic.
- LC-3 *Data Move* Instructions: Addressing Modes, LOADs and STOREs.
- LC-3 *Control* Instructions: Condition Codes, BR, JMP, JSR(R), TRAP.
- Machine Language Programming.

## Computer Systems (Chapters 7, 8, 10.1, 10.2, 12.5, 13, 14.3)

- Assembly Language Programming; Two-Pass assembly.
- I/O basics: Device Registers, Polling, Memory-Mapping.
- Interrupt-driven I/O: Enabling, Arbitrating and Responding to Interrupts; RTI.
- C Language implementation: memory management, control instructions, call/return.