Digital Logic and Computer Organization (3-0-2-4)

Course objective: This course provides an introduction to the design and implementation of digital circuits and microprocessors. Topics include transistor network design, Boolean algebra, combinational circuits, sequential circuits, finite state machine design, processor pipelines, and memory hierarchy. Design methodology using both discrete components and hardware description languages is covered in the course.

Topics:

- Combinational Circuits: Small and large Designs, Logic Expressions, Sum of Product Expression & Product of Sum Expression, Canonical Expression, Min-Terms, Max-Terms, Logic Minimization, Karnaugh Map, K-Map Minimization, Logic Minimization Algorithm, Minimization Software

- Other Gates, Buffer, Tri-State Buffer, Full Adder, Multiplexer, Decoder, Encoder, Circuit Timing Diagram, Signal Propagation Delay, Fan-In and Fan-Out, Programmable Logic Devices, Design Flow, Hardware Description Languages, Floating point standard

-Sequential Circuits: Core Modules, Small and large Designs. Latches, flipflops, Registers, HDL models, FSM, Single cycle, multi cycle, pipelining, Multipliers

-Memory. Multiplayers of memory, Memory types, Design Example: Multiprocessor Memory Architecture, HDL Models.

-Instruction Set Architecture. Types of Instruction Set Architecture, Design Example, Advanced Processor Architectures

-Computer Architecture: Interconnection, Memory Controller, I/O Peripheral Devices, Controlling and Interfacing I/O Devices, Data Transfer Mechanisms, Interrupts, Design Example: Interrupt Handling CPU. Computer Architecture: Security

Textbook:

Digital Design - M Mano and M Ciletti [Pearson]
Digital Design and Computer Architecture, Harris, Harris, 2nd Edition, Morgan Kaufmann.

Evaluation Components

Mid semester evaluation – 30%

End semester evaluation – 40%

Lab assignments – 30%

Attendance – 80%

Practice Sheets