EL454 CAD of VLSI

Credit Structure (L-T-P-Cr): 3-0-2-4

Course Objectives:

- Learn the hierarchy and design methodologies in VLSI systems.
- Conceptual designing and realizing a system at device, circuit, gate levels.
- Learn different levels of abstraction and corresponding hands on experience on various VLSI tools such as MATLAB, LabView, SPICE, Logisim, Verilog.
- Testing and Fault assessment in VLSI design.
- Understanding of designing practical electronic systems.
- Implementing and realizing circuits in hardware using FPGA.

Course Content:

Device and Circuit Level Design
Fundamentals of VLSI, Design methodologies in VLSI system, Role of computer aided design (CAD) tools, Introduction to device level simulators, Introduction to circuit level simulators, Basics of SPICE and Cadence tools, AC, DC, Transient, Noise, Temperature analyses, Characterization of diodes, BJTS, MOSFETs and advanced structures using SPICE, Schematic designing, Layout, Introduction to BSIM models, Extraction of MOSFET model parameters.

Introduction to MATLAB, Device characterization using MATLAB.
Reliability and Variability analyses, Parametric, Process corner and Monte-Carlo analyses.
On-chip Interconnects, Types of interconnects, Different structures of interconnects, Parasitic extraction, Simulation of on-chip interconnects, Different analytical models of interconnects.
Digital and analog circuit realization at circuit level.

Gate Level Design
Introduction to gate level simulators, Familiarization with Verilog hardware description language, Data types, Number system, Operators, Modeling schemes at gate level designs, Combinational circuit designing, Test benches, Timing and delay models, Sequential circuit designing, Blocking and non blocking assignments, Finite state machine cycle, Memory, I/O subsystems.
Basics of FPGA, Synthesis of gate levels design in FPGA, practical system realization using hardware modules.
Testing and verification, challenges in testing.
Course Outcome:

- Student shall be able to learn basic fundamentals and concepts of VLSI design and system.
- Students shall be able to understand flow of designing and implement at different levels of abstraction.

Text and Reference Books:

2. H.M. Rashid, Introduction to PSPICE, PHI.
6. Peter R. Wilson, Design Recipes for FPGAs, Elsevier.

Course Evaluation Policy:

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<th>Course Component</th>
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