



University Program

Curriculum

Synopsys supports universities with access to comprehensive Bachelor and Master programs for microelectronic design and EDA development. Course materials can be used to implement a new course or supplement content in an existing course quickly and easily.

All courseware described within may be downloaded from the Synopsys University Program [Member Only website](#) (requires SolvNet ID and password).

Full Semester Courseware

Synopsys has more than 130 full-semester courses available for Bachelor and Master Programs in microelectronic design and EDA. Each full-semester course contains ~15 weeks of material including a syllabus, lectures, labs, homework and exams.

Workshops and Lectures

Synopsys also offers 18 curriculum support modules that vary in length and include more Synopsys tool training materials than the full-semester courseware. Workshops and additional lectures cover topics on implementation, verification and TCAD.

Short Lectures and Labs

Additionally, our program includes 27 short lectures and labs that cover topics on circuit simulation, low power design, OpenSPARC and more. Synopsys tools are discussed and applied in each short lecture and lab for a thorough and practical understanding of the concepts.

Synopsys Curricula Advisory Board

The Synopsys Curricula Advisory Board is a group of academic experts working together to develop new microelectronic design courseware for Synopsys University Program members. In addition to generously helping to create and share some of their own materials, board members also provide valuable reviews and input for Synopsys developed courseware, as well as contributing to the overall content and direction of our program.

To learn more about the Synopsys Curricula Advisory Board please visit: www.synopsys.com/Community/UniversityProgram/Pages/CurriculaBoard

A full list of available courseware follows. Current as of January 2013.



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Synopsys is a world leader in electronic design automation (EDA), supplying the global electronics market with the software, intellectual property (IP) and services used in semiconductor design and manufacturing.



Full Semester Courseware

VLSI Design Curriculum

Digital System Architecture and Design

Bachelor Degree Courses:

- ▶ Digital ASIC Design
- ▶ Digital Integrated Circuits
- ▶ IC Design
- ▶ IC Design Flow
- ▶ IC Design Introduction
- ▶ IC Simulation Theory
- ▶ IC Testing
- ▶ Introduction to Circuits
- ▶ Introduction to Electronic Circuits
- ▶ Introduction to Logic Design
- ▶ Introduction to VLSI Design
- ▶ I/O Design
- ▶ Logic Design
- ▶ Synthesis of Digital Circuits

IC/Semiconductor Fabrication

Bachelor Degree Courses:

- ▶ IC Fabrication
- ▶ Introduction to Semiconductor Devices
- ▶ Principles of Semiconductor Devices
- ▶ Semiconductor Devices
- ▶ Semiconductor Technology
- ▶ VLSI Device and Process Simulation

Analog/RF Design

Bachelor Degree Courses:

- ▶ Analog Integrated Circuits
- ▶ Analog Integrated Circuit Design
- ▶ Introduction to RF Communication
- ▶ RF Circuits and Systems based on Custom Designer

Master's Degree Courses:

- ▶ Advanced Digital Integrated Circuits
- ▶ Advanced IC Physical Design
- ▶ Crosstalk and Noise
- ▶ Design for Test
- ▶ Design of Special I/Os
- ▶ Digital Signal Processing
- ▶ Digital VLSI Design
- ▶ Low Power Design
- ▶ Low Power Design with SAED 90nm EDK
- ▶ Low Power Methodology
- ▶ Modeling and Optimization of VLSI Interconnects
- ▶ Nano-Scale Circuits and Systems
- ▶ System-on-Chip Architecture Design
- ▶ VLSI Design
- ▶ VLSI Design Verification and Testing

Master's Degree Courses:

- ▶ Semiconductor Transport Theory and Monte Carlo Device Simulation

Master's Degree Courses:

- ▶ Advanced Analog Integrated Circuits
- ▶ Mixed-Signal IC Design
- ▶ RF IC Design



Full Semester Courseware

VLSI Design Curriculum Cont'd

Other

Bachelor Degree Courses:

- ▶ Computer Architecture
- ▶ Introduction to Communication, Control, and Signal Processing
- ▶ Linear Algebra
- ▶ Methods of Mathematical Physics
- ▶ Microprocessor Systems
- ▶ Nanoscale Electronic Materials
- ▶ Numerical Methods
- ▶ Physical-Chemical Bases of Micro- and Nanoelectronics
- ▶ Quantum Theory and Statistical Physics
- ▶ Scripting Language
- ▶ Signals and Systems
- ▶ System Level Design
- ▶ Technical Writing
- ▶ Theory Bases of Microcircuitry

Master's Degree Courses:

- ▶ Advanced IC Processing and Layout
- ▶ Advanced Integrated Circuits for Communications
- ▶ Advanced Methods in Logic Synthesis and Equivalence Checking
- ▶ Advanced Topics in Solid State Devices
- ▶ Complex Functions
- ▶ Design Techniques for Digital Systems
- ▶ Digital Communication
- ▶ EDA Tools
- ▶ Embedded Systems Design
- ▶ Fourier Transformations
- ▶ FPGA Prototyping
- ▶ Fuzzy Logic
- ▶ Introduction to Optical Communication Systems and Networks
- ▶ Principles of Digital and Wireless Communications
- ▶ Probability Theory and Mathematical Statistics
- ▶ Rad-hard IC Design
- ▶ Senior Design Project
- ▶ Solar Cell Physics
- ▶ Thermal and Electro-Thermal Simulation



Full Semester Courseware

EDA Curriculum

Digital System Architecture and Design

Bachelor Degree Courses:

- ▶ Hardware Description Languages
- ▶ IC Design Introduction

Analog/RF Design

Bachelor Degree Courses:

- ▶ Analog Integrated Circuits

Other

Bachelor Degree Courses:

- ▶ Advanced Operating Systems
- ▶ Algorithms & Structural Programming
- ▶ Computer Networks
- ▶ Data Structures
- ▶ Discrete Mathematics
- ▶ EDA Introduction
- ▶ EDA Mathematical Methods
- ▶ Elements of Software Construction
- ▶ Information Security
- ▶ Introduction to Algorithms
- ▶ Linear Algebra
- ▶ Mathematical Modeling
- ▶ Numerical Methods
- ▶ Optimization Methods
- ▶ Operating Systems and System Programming
- ▶ Programming Languages & Compilers
- ▶ Technical Writing
- ▶ Theory of Algorithms
- ▶ Unix System Administration

Master's Degree Courses:

- ▶ Low Power Design
- ▶ Modeling and Optimization of VLSI Interconnects
- ▶ Networked Computing
- ▶ Semiconductor Devices and Technology
- ▶ VLSI Design
- ▶ VLSI Design Algorithms
- ▶ VLSI Physical Design Algorithms

Master's Degree Courses:

- ▶ Artificial Intelligence
- ▶ Compilers Design
- ▶ Compiler Optimization and Code Generation
- ▶ Complex Functions
- ▶ Computational Geometry
- ▶ Contemporary Software Development Kits
- ▶ Databases
- ▶ Design of Programming Languages
- ▶ Discrete Mathematics and Probability
- ▶ Equations of Mathematical Physics
- ▶ Fourier Transformations
- ▶ Fuzzy Logic
- ▶ Networked Computing
- ▶ Object-Oriented Programming
- ▶ Operational Research
- ▶ Probability Theory and Mathematical Statistics
- ▶ Programming C++
- ▶ Software Development Technology
- ▶ Software Verification and Validation
- ▶ Symbolic Programming
- ▶ Synthesis and Optimization of Digital Integrated Circuits
- ▶ User/Interface Design
- ▶ VLSI Schematic Design Algorithms
- ▶ VLSI Verification Algorithms



Workshops and Lectures

Verification:

- ▶ System Verilog/Verification Methodology Manual (VMM)
- ▶ SystemVerilog Verification Tutorial
- ▶ Universal Verification Methodology
- ▶ Verilog HDL Basics

TCAD:

- ▶ TCAD Course
- ▶ TCAD for VLSI Design
- ▶ TCAD Short Course
- ▶ TCAD Quick Start Guide

Implementation:

- ▶ 90nm Digital Design Workshop
- ▶ ASIC Design Flow Tutorial Using Synopsys Tools
- ▶ Digital Design Flow Based on PowerPC 405 Processor
- ▶ Full Custom IC Design Flow Using Synopsys Custom Tools
- ▶ Software Methodology Using Custom Designer
- ▶ Synopsys Design Flow Tutorial
- ▶ Synopsys IC Design Flow Based on 90nm Generic Library
- ▶ Synthesis Basics
- ▶ UPF Workshop

Other:

- ▶ Project Management

Short Lectures/Labs

Circuit Simulation:

- ▶ Circuit Simulation: Transient Analysis
- ▶ Techniques for Circuit Simulation
- ▶ Thermal and Electro-Thermal Simulation: Achievements and Trends

Low Power Design:

- ▶ Low Power Methodology Manual for 90nm
- ▶ Low Power Methodology Manual for 32/28nm
- ▶ Subthreshold Design and Implementation
- ▶ Verification Methodology Manual for Low Power (VMM-LP)

OpenSPARC:

- ▶ Multi-threaded SPARC core verification using SystemVerilog Testbench
- ▶ Synthesizing 64-bit OpenSPARC multi-threaded core on FPGA with Synopsys Synplify tool chain
- ▶ Synthesizing a Design Using the 90nm Technology Library

Other:

- ▶ Addressing Process Variations and Patterning Issues in VLSI Designs
- ▶ Advanced RTL Verification Techniques
- ▶ Basic Pearl Programming
- ▶ Design Methods of Nanoscale Memories
- ▶ Design Methods of Nanoscale Sigma-Delta Modulators
- ▶ Embedded Systems Design
- ▶ How to Create an Interoperable PDK
- ▶ Introduction to Verilog HDL
- ▶ Logic Simulation with Consideration of Destabilizing Factors
- ▶ Nanoscale Low Power Digital Standard Cell Library
- ▶ Physical Verification Runset Development
- ▶ Power-Performance Optimization of Digital Circuits and Systems
- ▶ Process Variation Aware Design
- ▶ Sequential Elements
- ▶ Signal and Power Integrity: Current State and New Approaches
- ▶ Statistical Techniques for Timing Analysis: Current State and Trends
- ▶ TCAD Microelectronic Labs