



Course Title: ADVANCED HDL PROGRAMMING

Course Code: To be decided later

Credit Units: 4

Level: Doctorate

L	T	P/ S	SW/F W	TOTAL CREDIT UNITS
3	1	0	0	4

Course Objectives:

This course deals with the comprehensive knowledge about advanced Finite State Machine Design is introduced which is the basis of Digital Design up to the level of processors. VHDL is commonly used as a design-entry language for field-programmable gate arrays and application-specific integrated circuits in electronic design automation of digital circuits. The course aims to enable the student to design Digital Systems which have FSM as a base and implement their design using VHDL in to FPGAs

Prerequisites: Digital Electronics.

Course Contents / Syllabus:

Module I: Design of Sequential circuits	Weightage
Fundamental of Digital Circuits Examples of combinational circuits SR, JK, T and D flip Characteristic table, characteristic equation and excitation tables. Design of Finite State Machines: Mealy and Moore type using next state tables, state diagrams, state minimization State encoding: minimum bit change and hot one encodings. Comparative cost and delays	15%
Module II Basics of VHDL	20%
Introduction and Basic Design Units of VHDL Writing Entities for Digital circuits like decoders, registers etc Scalar Data types and Operations: Object types: constants, variables, signal and files. Data Types: scalar, integer, floating, physical, enumeration, type declarations, subtypes, expressions and operators for	

various types, variable and signal assignments.	
Module III VHDL Programming	15%
Behavioral Modeling: process statements, inertial and transport delay models, signal drivers, Sequential statements: If, case, Null, Loop, Exit, Next statements, while loops, For loops, Assertion and report statements Dataflow Modeling: Concurrent signal assignment, multiple drivers, block statement Structural Modeling: component declaration, component instantiation Generics, generic (AND, NAND, OR, NOR, XOR and XNOR) gates	
Module IV: Synthesis: mapping statements to gates	20%
VHDL modeling of basic gates, half and full adder AOI, IOA, OAI, multiplexes, decoders (dataflow, behavioral and structural modeling) Three state driver, parity checker, D, T, JK and SR flip flops, flip flops with preset and clear Modeling for multiplexer, priority encoder, state machine modeling. Moore and Mealy machines, generic priority encoder Writing a test bench Simple examples of Test benches	
Module V SENSOR NETWORK PLATFORMS AND TOOLS	15%
WLL architecture and technology, Bluetooth,Wi-Max,Adhoc Networks. Introduction to GSM and CDMA, GSM: architecture, channels, GPRS.	
Module VI Introduction to FPGA	15%
FPGA & CPLD Architectures, FPGA Programming Technologies, FPGA Logic Cell Structures FPGA Programmable Interconnect and I/O Ports, FPGA Implementation of Combinational Circuits, FPGA Sequential Circuits, Timing Issues in FPGA Synchronous Circuits	

Student Learning Outcomes:

Outcome 1: Develop an understanding to design Finite State Machines

Outcome 2: Design a digital system or component in order to meet a set of specification.

Outcome 3: Code combinational and sequential digital circuits using different styles of modeling of VHDL.

Outcome 4: Detail knowledge of FPGA architecture and its programming details

Pedagogy for Course Delivery: The class shall be delivered using lectures and tutorials.

Assessment/ Examination Scheme:

Theory L/T (%)	Lab/Practical/Studio (%)	End Term Examination
100%	-NA-	100%

Theory Assessment (L&T):

Continuous Assessment/Internal Assessment					End Term Examination
Components (Drop down)	Mid-Term Exam	Project	Viva	Attendance	
Weightage (%)	10%	8%	7%	5%	70%

Text:

- Daniel Gajski: Principles of Digital Design, Prentice Hall; 1st edition (September 19, 1996), **ISBN-13:** 978-0133011449
- Pedroni: Circuit Design with VHDL The MIT Press (August 1, 2004) **ISBN-13:** 978-0262162241
- Bhasker: A VHDL Primer, Prentice Hall; 3 edition (1999), **ISBN-10:** 0130965758
- Wayne Wolf, "FPGA-Based System Design," Prentice Hall, 2004, ISBN: 978-0131424616
- Steve Kilts, "Advanced FPGA Design," Wiley Inter-Science, ISBN 9780470054376

References:

- Perry: VHDL: Programming by examples, McGraw-Hill Professional Publishing (May 12, 2002), ASIN: B00IH23UZU
- K. Skahill, VHDL for programmable Logic, Prentice Hall (June 13, 1996) ISBN-13: 978-0201895735