M.Tech(VLSI&ES) Course Structure & Syllabus – R23

S. No	Course code	Course Name	Category	L	T	P	Credits
1	MTVE1101	Advanced Digital System Design	PC	3	0	3	4.5
2	MTVE1102	Embedded System Design	PC	3	0	0	3
3	MTVE1103	1. Scripting Languages 2. Advanced Computer architecture 3. VLSI Technology 4. Algorithms for VLSI Design	PE	3	0	0	3
4	MTVE1104	1. Embedded C 2. Hardware Software Co-Design 3.VLSI architectures 4. Low Power VLSI Design	PE	3	0	0	3
5	MTVE1105	Research methodology and IPR	CC	2	0	0	2
6	MTVE1107	Embedded System Design Lab	LB	0	0	3	1.5
7	MTVE1108	Audit course-1	AC	2	0	0	0
Total							**17**

S. No	Course code	Course Name	Category	L	T	P	Credits
1	MTVE1201	Analog CMOS VLSI Design	PC	3	0	3	4.5
2	MTVE1202	System Design with Embedded Linux	PC	3	0	0	3
3	MTVE1203	1.System on Chip Design 2. Internet of Things and its Applications 3.Embedded Networks 4. System Verilog & UVM	PE	3	0	0	3
4	MTVE1204	1.Design for Testability 2. Physical Design Verification 3. Network Security and cryptography 4. Sensors and Sensor Interfacing	PE	3	0	0	3
6	MTVE1206	System Design with Embedded Linux Lab	LB	0	0	3	1.5
7	MTVE1207	Mini Project/ Innovative Project with Seminar	MP	2	0	0	2
8	MTVE1208	Audit Course – 2	AC	2	0	0	0
Total							17
Two months Mandatory Industrial Training/Internship during summer / semester break							

Student has to choose any one audit course listed below.

Audit Course 1 & 2:

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technical Knowledge
4. Value Education

S. No	Course Code	Course Name	Category	L	T	P	Credits
1	MTVE2101	1.CMOS Mixed Signal Circuit Design 2.Artificial Intelligence & Machine Learning 3.RF IC Design 4.Optimization Techniques MOOCs-1 (NPTEL/SWAYAM)	PE	3	0	0	3
2	MTVE2102	1. Business Analytics 2. Industrial Safety 3. Operations Research 4. Cost Management of Engineering Projects 5. Composite Materials 6. Waste to Energy 7. Design Thinking 8. Entrepreneurship 7. MOOCs-2 (NPTEL/SWAYAM)-Any 12 Week Course on Engineering/ Management/ Mathematics offered by other than parent department	OE	3	0	0	3
3	MTVE2103	**Internship**		-	-	-	2

		(Performed during summer / I year break)					
4	MTVE2104	Dissertation Phase -I /Industrial Project **(to be continued and evaluated next semester)**	PJ	0	0	20	10
Total							**18**

#Students going for Industrial Project/Thesis will complete these courses through MOOCs

M. Tech. IV SEMESTER							
S.No	**Course Code**	**Courses**	**Category**	**L**	**T**	**P**	**C**
1	MTVE2201	**Dissertation-Part II/ Industrial Project part II**	PJ	0	0	32	16
Total Credits							16

M. Tech-I Year I Semester-VLSI & ES

Advanced Digital System Design

Pre-Requisite: Switching Theory and Logic Design

Course Objectives:

1. To provide extended knowledge of digital logic circuits in the form of state model approach.
2. To provide an overview of system design approach using programmable logic devices.
3. To provide and understand of fault models and test methods.
4. To get exposed to the various architectural features of CPLDS and FPGAS.
5. To learn the methods and techniques of CPLD & FPGA design with EDA tools.
6. To expose software tools used for design process with the help of case studies.

Course Outcomes:

1. To exposes the design approaches using FPGAs.
2. To provide in depth understanding of Fault models.
3. To understands test pattern generation techniques for fault detection.
4. To design fault diagnosis in sequential circuits.
5. To provide understanding in the design of flow using case studies.

UNIT-I

Programmable Logic Devices: The concept of programmable Logic Devices, SPLDs, PAL devices, PLA devices, GAL devices, CPLD-Architecture, FPGAs-FPGA technology, architecture, virtex CLB and slice, FPGA Programming Technologies, Xilinx XC2000, XC3000, XC4000 Architectures, Actel ACT1,ACT2 and ACT3 Architectures.

UNIT-II

Analysis and derivation of clocked sequential circuits with state graphs and tables: A sequential parity checker, Analysis by signal tracing and timing charts-state tables and graphs-general models for sequential circuits, Design of a sequence detector, More Complex design problems, Guidelines for construction of state graphs, serial data conversion, Alphanumeric state graph notation. Need and Design strategies for multi-clock sequential circuits.

UNIT-III

Sequential circuit Design: Design procedure for sequential circuits-design example, Code converter, Design of Iterative circuits, Design of a comparator, Controller (FSM) – Metastability, Synchronization, FSM Issues, Pipelining resources sharing, Sequential circuit design using FPGAs, Simulation and testing of Sequential circuits, Overview of computer Aided Design.

UNIT-IV

Fault Modeling and Test Pattern Generation: Logic Fault Model, Fault detection & redundancy, Fault equivalence and fault location, Fault dominance, Single stuck at fault model, multiple Stuck at Fault models, Bridging Fault model.

Fault diagnosis of combinational circuits by conventional methods, path sensitization techniques, Boolean difference method, KOHAVI algorithm, Test algorithms-D algorithm, Random testing, transition count testing, signature analysis and test bridging faults.

NW

UNIT -V

Fault Diagnosis in sequential circuits: Circuit Test Approach, Transition check Approach, State identification and fault detection experiment, Machine identification, Design of fault detection experiment.

TEXT BOOKS:

1. Digital Electronics and design with VHDL- Volnei A. Pedroni, Elsevier Publications.
2. Fundamentals of Logic Design-Charles H. Roth, Jr. -5thEd.,Cengage Learning.
3. Digital Circuits and Logic Design-Samuel C.LEE,PHI, 2008.

REFERENCE BOOKS:

1. Logic Design Theory-N.N. Biswas, PHI.
2. Digital System Design using programmable logic devices- Parag K. Lala, BS publications.
3. Switching and Finite Automata Theory - Zvi Kohavi & Niraj K. Jha, 3rd Edition, Cambridge, 2010

M. Tech-I Year I Semester-VLSI & ES

Embedded System Design

Pre-requisite:

	Course Outcomes: At the end of the course, student will be able to	Knowledge Level (K)#
CO1	Introduction to embedded system, Classification, applications in various areas of embedded system. Compare embedded system Versus general computing system.	K4
CO2	Analyze typical embedded system. Understand embedded communication interface.	K4
CO3	Design embedded firmware approaches and development languages.	K6
CO4	Design ARM architecture.	K6
CO5	Illustrate operating modes and ARM processor families, categorize ARM instruction set.	K3
CO6	Design and develop programming the raspberry pi using python.	K6

UNIT I

Introduction to Embedded Systems

Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

UNIT II

Typical Embedded System

Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

UNIT III

Embedded Firmware

Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

UNIT -IV

ARM: ARM design philosophy, data flow model and core architecture, registers, program status register, instruction pipeline, interrupts and vector table, operating modes and ARM processor families.

Instruction Sets: Data processing instructions, addressing modes, branch, load, store instructions, PSR instructions, and conditional instructions.

UNIT -V

Raspberry Pi: Raspberry Pi board and its processor, Programming the Raspberry Pi using Python, Communication facilities on Raspberry Pi (I2C, SPI, UART), Interfacing of sensors and actuators.

Text Book:

1. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill.

2. A. N. Sloss, D. Symes, and C. Wright, "ARM System Developer's Guide: Designing and Optimizing System Software", Elsevier, 2008.

3. S. Monk, "Programming the Raspberry Pi" McGraw-Hill Education, 2013.

REFERENCE BOOKS:

1. Steave Furber, "ARM system-on-chip architecture", Addison Wesley, 2000.

2.Embedded Systems - Raj Kamal, TMH.

3. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SCRIPTING LANGUAGES
(ELECTIVE- I)

PRE-REQUISITES: Linux Basics, Basics of C

COURSE OBJECTIVES:

- To understand the importance of scripting languages in VLSI Design
- To describe the various PERL concepts used in VLSI design for large data handling
- To understand utilization of TCL in CAD Tools Interfacing
- To interpret PYTHON language

COURSE OUTCOMES: At the end of this course, the student will be able to:

CO-1: Gain fluency in programming with scripting languages

CO-2: Create and run scripts using PERL/TCL/PYTHON in CAD Tools

CO-3: Demonstrate the use of PERL/PYTHON/ TCL in developing system and web Applications

UNIT-I:

Introduction to Scripts and Scripting: Basics of Linux, Origin of Scripting languages, scripting today, Characteristics and uses of scripting languages.

UNIT-II:

PERL: Introduction to PERL, Names and values, Variables and assignment, Scalar expressions, Control structures, Built-in functions, Collections of Data, working with arrays, Lists and hashes, Simple input and output, Strings, Patterns and regular expressions, Subroutines, Scripts with arguments.

UNIT-III:

Advanced PERL: Finer points of Looping, Subroutines, Using Pack and Unpack, working with files, Type globs, Eval, References, Data structures, Packages, Libraries and modules, Objects, Object and modules in action, Tied variables, interfacing to the operating systems, Security issues.

UNIT-IV:

TCL: The TCL phenomena, Philosophy, Structure, Syntax, Parser, Variables and data in TCL Control flow, Data structures, Simple input/output, Procedures, Working with Strings, Patterns, File and Pipes, Example code.

UNIT-V:

PYTHON: Introduction to PYTHON language, PYTHON-syntax, statements, functions, Built-in functions and Methods, Modules in PYTHON, Exception Handling.

TEXT BOOKS:

1. The World of Scripting Languages- David Barron, Wiley Student Edition, 2010.
2. PYTHON Web Programming, Steve Holden and David Beazley, New Riders Publications 12

REFERENCES:

1. TCL/TK: A Developer's Guide- ClifFlynt, 2003, Morgan Kaufmann Series.
2. Core PYTHON Programming, Chun, Pearson Education, 2006.
3. Learning Perl, Randal L. Schwartz, O' Reilly publications 6th edition 2011.
4. Linux: The Complete Reference", Richard Peterson McGraw Hill Publications, 6th Edition, 2008

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Advanced Computer Architecture
(ELECTIVE-I)

OBJECTIVES:

The main objectives of this course are given below:

The objective of this course is to provide students with the basic concepts and principles in computer architecture so that students have in-depth understanding of computer system organizations and computer system designs.

OUTCOMES:

At the end of this course the student can able to:

1 Through this course, students are expected to become conversant with a large body of concepts and accompanying terminology in computer architecture.

2 The course will be helpful for students to read and understand technical articles or promotional brochures that describe new computer architectures and appreciate the design issues and tradeoffs of that architecture.

3 This course will introduce the current trends in computer architecture so that students have some sense of the future directions of computational machines.

4 Students will also learn how to quantitatively analyze, compare, and evaluate the performance of computer systems.

SYLLABUS:

UNIT -I:
Fundamentals of Computer Design:
Fundamentals of Computer design, changing faces of computing and task of computer designer, Technology trends, Cost price and their trends, measuring and reporting performance, quantitative principles of computer design, Amdahl's law.
Instruction set principles and examples- Introduction, classifying instruction set- memory addressing-type and size of operands, operations in the instruction set.

UNIT –II:
Pipelines:
Introduction, basic RISC instruction set, Simple implementation of RISC instruction set, Classic five stage pipe line for RISC processor, Basic performance issues in pipelining , Pipeline hazards, Reducing pipeline branch penalties.
Memory Hierarchy Design:
Introduction, review of ABC of cache, Cache performance, Reducing cache miss penalty, Virtual memory.

UNIT -III:

Instruction Level Parallelism - The Hardware Approach:

Instruction-Level parallelism, Dynamic scheduling, Dynamic scheduling using Tomasulo's approach, Branch prediction, high performance instruction delivery- hardware based speculation.

ILP Software Approach:

Basic compiler level techniques, static branch prediction, VLIW approach, Exploiting ILP, Parallelism at compile time, Cross cutting issues -Hardware verses Software.

UNIT –IV:

Multi Processors and Thread Level Parallelism:

Multi Processors and Thread level Parallelism- Introduction, Characteristics of application domain, Systematic shared memory architecture, Distributed shared – memory architecture, Synchronization

UNIT – V:

Inter Connection and Networks:

Introduction, Interconnection network media, Practical issues in interconnecting networks, Examples of inter connection, Cluster, Designing of clusters.

Intel Architecture:

Intel IA- 64 ILP in embedded and mobile markets Fallacies and pit falls

TEXT BOOKS:

John L. Hennessy, David A. Patterson, Computer Architecture: A Quantitative Approach, 3rd Edition, An Imprint of Elsevier.

REFERENCE BOOKS:

1. John P. Shen and Miikko H. Lipasti, Modern Processor Design : Fundamentals of Super Scalar Processors
2. Computer Architecture and Parallel Processing ,Kai Hwang, Faye A.Brigs., MC Graw Hill.,
3. Advanced Computer Architecture - A Design Space Approach, DezsoSima, Terence Fountain, Peter Kacsuk ,Pearson ed.

I year M.Tech (VLSI & ES) R23 Syllabus.

VLSI Technology

Course objectives:

- To understand the semiconductor materials, devices and technology historical evaluations
- To explain the oxidization process and quality measures in the fabrication
- To explain lithography importance in the semiconductor industry and the various techniques
- To understand other process steps like etching, implantation and metallization and their implications.
- To explain the passive components fabrication process
- To understand the impact of other semiconductor technologies like MEMS
- To understand the concepts of electrical testing and packaging of ICs

Unit- I

Introduction: Semiconductor materials, semiconductor devices, semiconductor process technology, basic fabrication steps. Crystal growth: Silicon crystal growth from melt, silicon float-zone process, GaAs crystal growth techniques, material characterization

Unit- II

Silicon Oxidation: Thermal oxidation, impurity redistribution during oxidation, masking properties of silicon dioxide, oxide quality, oxide thickness characterization. Photolithography: Optical lithography, E-beam lithography.

Unit- III

Etching: Wet chemical etching, Dry etching. Diffusion: Basic diffusion process, extrinsic diffusion, laterals diffusion.

Unit- IV

Ion Implantation: Range of implanted ions, implant damage and annealing. Film Deposition: Epitaxial growth techniques, structures and defects in epitaxial layers, dielectric deposition, polysilicon deposition.

Unit- V

Process Integration: Passive components, bipolar technology, MESFET technology, MEMS technology. IC Manufacturing: Electrical testing, Packaging.

Text Books:

1. Gary S May & Simon M Sze, Fundamentals of Semiconductor Fabrication, Wiley Student Edition, 2012

References:

1. S. K. Ghandhi, VLSI Fabrication Principles, John Wiley Inc, 2010.
2. S. M. Sze, VLSI Technology, 2/e, McGraw Hill, 2011.
3. Stephen Cambell, The Science and Engineering of Microelectronic Fabrication, Oxford University Press, 2013.

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B. T. Krishna

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M. Tech I Year I Semester VLSI&ES

Algorithms for VLSI Design
(ELECTIVE I)

UNIT- I: PRELIMINARIES:

Introduction to Design Methodologies, Design Automation tools, Algorithmic Graph Theory, Computational complexity, Tractable and Intractable problems.

UNIT -II: GENERAL PURPOSE METHODS FOR COMBINATIONAL OPTIMIZATION:

Backtracking, Branch and Bound, Dynamic Programming, Integer Linear Programming, Local Search, Simulated Annealing, Tabu search, Genetic Algorithms.

UNIT- III: LAYOUT COMPACTION, PLACEMENT, FLOOR PLANNING AND ROUTING:

Problems, Concepts and Algorithms.

MODELLING AND SIMULATION:

Gate Level Modelling and Simulation, Switch level Modelling and Simulation.

UNIT -IV: LOGIC SYNTHESIS AND VERIFICATION:

Basic issues and Terminology, Binary-Decision diagrams, Two-Level logic Synthesis.

HIGH-LEVEL SYNTHESIS:

Hardware Models, Internal representation of the input Algorithm, Allocation, Assignment and Scheduling, Some Scheduling Algorithms, Some aspects of Assignment problem, High-level Transformations.

UNIT- V: PHYSICAL DESIGN AUTOMATION OF FPGAs:

FPGA technologies, Physical Design cycle for FPGAs, partitioning and Routing for segmented and staggered Models.

PHYSICAL DESIGN AUTOMATION OF MCMs:

MCM technologies, MCM physical design cycle, Partitioning, Placement – Chip Array based and Full Custom Approaches, Routing – Maze routing, Multiple stage routing, Topologic routing, Integrated Pin – Distribution and routing, Routing and Programmable MCMs.

TEXT BOOKS:

- S.H. Gerez, "Algorithms for VLSI Design Automation", 1999, WILEY Student Edition, John Wiley & Sons (Asia) Pvt. Ltd.
- Naveed Sherwani, "Algorithms for VLSI Physical Design Automation", 3rd Edition, 2005, Springer International Edition.

REFERENCE BOOKS:

- Hill & Peterson, "Computer Aided Logical Design with Emphasis on VLSI", 1993, Wiley.
- Wayne Wolf, "Modern VLSI Design: Systems on silicon", 2nd ed., 1998, Pearson Education Asia

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M. Tech I Year I Semester VLSI&ES

Embedded C

(ELECTIVE-II)

UNIT-I:

Programming Embedded Systems in C

Introduction, What is an embedded system, Which processor should you use, Which programming language should you use, Which operating system should you use, How do you develop embedded software, Conclusions

Introducing the 8051 Microcontroller Family

Introduction, What's in a name, The external interface of the Standard 8051, Reset requirements, Clock frequency and performance, Memory issues, I/O pins, Timers, Interrupts, Serial interface, Power consumption, Conclusions

UNIT-II: Reading Switches

Introduction, Basic techniques for reading from port pins, Example: Reading and writing bytes, Example: Reading and writing bits (simple version), Example: Reading and writing bits (generic version), The need for pull-up resistors, dealing with switch bounce, Example: Reading switch inputs (basic code), Example: Counting goats, Conclusions

UNIT-III: Adding Structure to the Code

Introduction, Object-oriented programming with C, The Project Header (MAIN.H), The Port Header (PORT.H), Example: Restructuring the 'Hello Embedded World' example, Example: Restructuring the goat-counting example, Further examples, Conclusions

UNIT-IV: Meeting Real-Time Constraints

Introduction, Creating 'hardware delays' using Timer 0 and Timer 1, Example: Generating a precise 50 ms delay, Example: Creating a portable hardware delay, Why not use Timer 2?, The need for 'timeout' mechanisms, Creating loop timeouts, Example: Testing loop timeouts, Example: A more reliable switch interface, Creating hardware timeouts, Example: Testing a hardware timeout, Conclusions

UNIT-V: Case Study-Intruder Alarm System

Introduction, The software architecture, Key software components used in this example, running the program, the software, Conclusions

TEXT BOOKS:

1. Embedded C - Michael J. Pont, 2nd Ed., Pearson Education, 2008.

REFERENCE BOOKS:

1. PIC MCU C-An introduction to programming, The Microchip PIC in CCS C – Nigel Gardner.

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M. Tech -I Year I Semester-VLSI & ES

HARDWARE SOFTWARE CO-DESIGN
(ELECTIVE-II)

UNIT-I: Co- Design Issues
Co- Design Models, Architectures, Languages, A Generic Co-design Methodology.
Co- Synthesis Algorithms
Hardware software synthesis algorithms: hardware – software partitioning distributed system co-synthesis.

UNIT-II: Prototyping and Emulation
Prototyping and emulation techniques, prototyping and emulation environments, future developments in emulation and prototyping architecture specialization techniques, system communication infrastructure
Target Architectures
Architecture Specialization techniques, System Communication infrastructure, Target Architecture and Application System classes, Architecture for control dominated systems (8051-Architectures for High performance control), Architecture for Data dominated systems (ADSP21060, TMS320C60), Mixed Systems.

UNIT-III: Compilation Techniques and Tools for Embedded Processor Architectures
Modern embedded architectures, embedded software development needs, compilation technologies, practical consideration in a compiler development environment.

UNIT-IV: Design Specification and Verification
Design, co-design, the co-design computational model, concurrency coordinating concurrent computations, interfacing components, design verification, implementation verification, verification tools,Interface verification.

UNIT-V: Languages for System-Level Specification and Design-I
System-level specification, design representation for system level synthesis, system level specification languages.
Languages for System-Level Specification and Design-II
Heterogeneous specifications and multi language co-simulation, the cosyma system and lycos system.

TEXT BOOKS:

1. Hardware / Software Co- Design Principles and Practice – Jorgen Staunstrup, Wayne Wolf – 2009, Springer.
2. Hardware / Software Co- Design - Giovanni De Micheli, Mariagiovanna Sami, 2002, Kluwer Academic Publishers.

REFERENCE BOOKS:

1. A Practical Introduction to Hardware/Software Co-design -Patrick R. Schaumont - 2010 – Springer Publications

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M. Tech I Year I Semester VLSI&ES

LOW POWER VLSI DESIGN
(ELECTIVE- II)

UNIT-I: Sources of Power Dissipation

Introduction, Short-CircuitPower Dissipation, Switching Power Dissipation, Dynamic Power for a Complex Gate, Reduced Voltage Swing, Switching Activity, Leakage Power Dissipation, p–n Junction Reverse-Biased Current, Band-to-Band Tunneling Current, Subthreshold Leakage Current, Short-Channel Effects.

UNIT 2: Supply Voltage Scaling for Low Power

Device Feature Size Scaling, Constant-FieldScaling, Constant-Voltage Scaling, Architectural-Level Approaches: Parallelism for Low Power, Pipelining for Low Power, Combining Parallelism with Pipelining, Voltage Scaling Using High-Level Transformations: Multilevel Voltage Scaling Challenges in MVSVoltage Scaling Interfaces, Static Timing Analysis Dynamic Voltage and Frequency Scaling

UNIT-3: Switched Capacitance Minimization

Probabilistic Power Analysis: Random logic signals, probability and frequency, probabilistic power analysis techniques, signal entropy,Bus Encoding: Gray Coding, One-Hot Coding, Bus-Inversion, T0 Coding, Clock Gating, Gated-Clock FSMs FSM State Encoding, FSM Partitioning, Precomputation, Glitching Power Minimization

UNIT 4: Leakage Power Minimization

Fabrication of Multiple Threshold Voltages, Multiple Channel Doping, Multiple Oxide CMOS, Multiple Channel Length, Multiple Body Bias, VTCMOS Approach, MTCMOS Approach, Power Gating, Clock Gating Versus Power Gating, Power-Gating Issues, Isolation Strategy, State Retention Strategy, Power-Gating Controller, Power Management, Combining DVFS and Power Management

UNIT 5: Low power clock distribution &Simulation Power Analysis

Low power clock distribution: Power dissipation in clock distribution, single driver versus distributed buffers, Zero skew versus tolerable skew, chip and package co design for clock network.Simulation Power Analysis: SPICE circuit simulators, gate level logic simulation, capacitive power estimation, architecture level analysis, data correlation analysis of DSP systems, Monte Carlo Simulation.

TEXT BOOKS:

1. Low-Power VLSI Circuits and Systems,Ajit Pal, SPRINGER PUBLISHERS

2. PRACTICAL LOW POWER DIGITAL VLSI DESIGN , Gary Yeap Motorola, SPRINGER SCIENCE+BUSINESS MEDIA, LLC.

REFERENCE BOOKS:

1. Low Power CMOS Design – AnanthaChandrakasan, IEEE Press/Wiley International, 1998. 2
2. MassoudPedram, Jan M. Rabaey , "Low power design methodologies ", Kluwer Academic Publishers.
3. Low Power CMOS VLSI Circuit Design – A. Bellamour, M. I. Elamasri, Kluwer Academic Press, 1995.

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M. Tech I Year I Semester VLSI&ES

Research Methodology and IPR

Course Outcomes:

At the end of this course, students will be able to

- Understand research problem formulation.
- Analyze research related information
- Follow research ethics
- Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

Syllabus Contents:

Unit I: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.

Unit II: Effective literature studies approaches, analysis Plagiarism, Research ethics. Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.

Unit III: Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development International Scenario: International cooperation on Intellectual Property. Procedure for grant of patents, Patenting under PCT.

Unit IV: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

Unit V: New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

References:

- Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"
- Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
- Ranjit Kumar, 2nd Edition , "Research Methodology: A Step by Step Guide for beginners"
- Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
- Mayall , "Industrial Design", McGraw Hill, 1992.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I-M.Tech(VLSI&ES) I-Semester R23-Syllabus

Advanced Digital System Design Lab

Part - I:

Programming can be done using either VHDL/Verilog HDL. Download the programs on FPGA boards and performance testing may be done using pattern generator (32 channels) and logic analyzer apart from verification by simulation with any of the front-end tools and implement all the Designs in FPGA Kits.

List of Experiments:

1. Design of Memory (RAM and ROM).
2. Design of Control Unit and Data Processor Logic Design
3. Design and implementation of Hamming Code.
4. Design of Sequence Detector (Finite State Machine- Mealy and Moore Machines).
5. Design of DNA Sequence Detector
6. Design of Pulse Width Modulation
7. Design of UART Transmitter and Receiver Module
8. Design of Seven Segment Display
9. Design of Traffic Light Controller
10. Design and simulation of Home Alarm System.
11. Design and simulation of Digital Clock.
12. Design and simulation of Vending Machine.

Lab Requirements:

Software required:

Xilinx Vivado Tool.

Hardware required:

- Personal Computer.
- FPGA Development Board.

(Dr. N. Balaji, Professor) (Smt. P. Pushpa Latha, Assistant Professor)