PROGRAMME GUIDE

MASTER OF TECHNOLOGY (VLSI)
(M.Tech VLSI)

*Scheme of Examination (CBCS/ELECTIVE)
*Detailed Structure of Syllabus

DR. C.V. RAMAN UNIVERSITY
KARGI ROAD, KOTA, BILASPUR, CHATTISGARH(C.G.)
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HOD (ECE DEPT.)
DR. C.V. RAMAN INSTITUTE OF SCIENCE AND TECHNOLOGY

Deputy Registrar (Academic)
Dr. C.V. Raman University
Kota, Bilaspur (C.G.)

Principal
Dr.C.V.Raman Institute of Science & Technology
Kargi Road,Kota
Dist. Bilaspur(C.G.)

MASTEROFTECHNOLOGY

Duration:24Months(2Years)

Eligibility: BE/B. Tech in a Related Field with Qualified Marks

COURSE STRUCTURE OF M-TECH IN :- VLSI DESIGN SEMESTER Ist													
Course Details				External Assessment		Internal Assessment				Credit Distribution			Allotted Credits
Course Code	Course Type	Course Title	Total Marks	Major		Minor		Sessional ***		L	T	P	Subject wise Distribution
				Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks				
Theory Group													
6TMVD 101	Core-1	Ad Mathematics	100	50	17	20	07	30	15	2	1	0	3
6TMVD 102	Core-2	CMOS VLSI Design	100	50	17	20	07	30	15	2	1	0	3
6TMVD 103	Core-3	Ad Logic Design	100	50	17	20	07	30	15	2	1	0	3
6TMVD 104	Core-4	Digital Signal Processing	100	50	17	20	07	30	15	2	1	0	3
6TMVD 105	Core-5	Embedded Microcontroller Programming	100	50	17	20	07	30	15	2	1	0	3
6TMVD 106	ProgramElective-1	Audit Course-I 1. English for research paper writing 2. Pedagogy studies 1.Stress management by Yoga	-	-	-	-	-	-	-	-	-	-	-
Practical Group				Term End Practical Exam				Sessional					
6TMVD 107	Core Lab-1	LAB-I	50	25	12			25	12	-	-	1	1
6TMVD 108	Core Lab-2	LAB-II	50	25	12			25	12	-	-	1	1
Grand Total			600							10	5	2	17

Minimum Passing Marks are equivalent to Grade D
Major-Term End Theory/Practical Exam
Minor-Pre University Test
Sessional weightage–Attendance 50%,
Three Class Tests/Lab Performance Assignment50%

L- Lectures T-Tutorials P-Practical

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Course Details				External Assessment		Internal Assessment				Credit Distribution			Allotted Credits	
Course Code	Course Type	Course Title	Total Marks	Major		Minor		Sessional ***		L	T	P	Subject wise Distribution	
				Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks					
Theory Group														
6TMVD 201	Core-6	VLSI Test & Testability	100	50	17	20	07	30	15	2	1	0	3	
6TMVD 202	Core-7	Real Time operating system	100	50	17	20	07	30	15	2	1	0	3	
6TMVD 203	Core-8	VLSI Technology	100	50	17	20	07	30	15	2	1	0	3	
6TMVD 204	Core-9	Embedded computing system design	100	50	17	20	07	30	15	2	1	0	3	
6TMVD 205	Core-10	Micro electronics	100	50	17	20	07	30	15	2	1	0	3	
6TMVD 206	Program Elective-2	**Audit Course-II** 1. Disaster management 2. Personality Development through life enlightenment skills 3. Value addition	-	-	-	-	-	-	-	-	-	-	-	
Practical Group				Term End Practical Exam				Sessional						
6TMVD 207	Core Lab-3	LAB III	50	25	12			25	12	-	-	1	1	
6TMVD 208	Core Lab-4	LAB IV	50	25	12			25	12	-	-	1	1	
Grand Total			600							10	5	2	17	

L- Lectures T-Tutorials P-Practical

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COURSE STRUCTURE OF M-TECH IN :- VLSI DESIGN SEMESTER IIIrd														
Course Details				External Assessment		Internal Assessment				Credit Distribution			Allotted Credits	
Course Code	Course Type	Course Title	Total Marks	Major		Minor		Sessional ***		L	T	P	Subject wise Distribution	
				Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks					
Theory Group														
***	Program Elective – III	6 TMVD301 (A) Opto Electronics Integrated Circuits 6 TMVD301 (B) System on Chip (SoC) Design 6 TMVD301 (C) Fundamentals and Applications of MEMS	100	50	17	20	07	30	15	2	1	0	3	
***	Program Elective – IV	6 TMVD302 (A) Communication RF IC Design 6 TMVD302 (B) Embedded System Programming 6 TMVD302 (C) Digital HDL Design and Verification	100	50	17	20	07	30	15	2	1	0	3	
Practical Group				Term End Practical Exam				Sessional						
6TMVD 303	Seminar	Seminar	100	50	25	-	-	50	25	-	-	1	1	
6TMVD 304	Dissertation	Dissertation Part-I	200	120	60	-	-	80	40	-	-	10	10	
Grand Total			500							4	2	11	17	

Minimum Passing Marks are equivalent to Grade D

L- Lectures T- Tutorials P- Practical

Major- Term End Theory / Practical Exam

Minor- Pre University Test

Sessional weightage – Attendance 50%, Three Class Tests/ Lab Performance Assignment 50%

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Duration: 24Months (2Years)

Eligibility: BE/B. Tech in a Related Field with Qualified Marks

COURSE STRUCTURE OF M-TECH IN :- VLSI DESIGN SEMESTER IVth															
Course Details				External Assessment		Internal Assessment				Credit Distribution			Allotted Credits		
Course Code	Course Type	Course Title	Total Marks	Major		Minor		Sessional ***		L	T	P	Subject wise Distribution		
				Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks						
Practical Group				Term End Practical Exam				Sessional							
6TMVD 401	Dissertation	Dissertation Part-II	500	300	150			200	100	-	-	17	17		
Grand Total			500							-	-	17	17		

Minimum Passing Marks are equivalent to Grade D
Major-Term End Theory/Practical Exam
Minor-Pre University Test
Sessional weightage–Attendance50%,
Three Class Tests/Lab Performance Assignment 50%

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SEMESTER- 1st
Course: M. Tech VLSI
SUBJECT: Ad Mathematics

Subject Code: 6TMVD101
Theory Max. Marks: 50
Theory Min. Marks: 17

COURSE OBJECTIVE:

To provide the student with the concept and the understanding of basics in partial differential equations and transform. The objective of this course is to fulfill the needs of Engineers to understand the Applications of probability, stochastic process, Queuing system, fuzzy sets and reliability Techniques in order to acquire Mathematical knowledge and to Solving a wide range of Practical Problems.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Solution of Partial Differential Equation (PDE) by separation of variable method, Numerical solution of PDE (Laplace, Poisson's, Parabola) using finite difference Methods, Elementary properties of FT, DFT, WFT, Wavelet transform, Haar transform.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – II	Probability, compound probability and discrete random variable. Binomial, Normal, Poisson's distribution. Sampling distribution, elementary concept of estimation and theory of hypothesis, recurred relations.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – III	Stochastic process, Markov process transition probability transition probability matrix, Just and higher order Markov process, Markov chain. Queuing system, transient and Steady state, traffic intensity, distribution queuing system, concepts of queuing models (M/M/1: Infinity/ Infinity/ FC FS), (M/M/1: N/ Infinity/ FC FS), (M/M/S: Infinity/ Infinity/ FCFS)	Usage of ICT like PPT, Video Lectures, Black board.
Unit – IV	Operations of fuzzy sets, fuzzy arithmetic & relations, fuzzy relation equations, fuzzy logics. MATLAB introduction, programming in MATLAB scripts, functions and their Application.	Usage of ICT like PPT, Video Lectures, Black board.
Unit - V	Introduction and definition of reliability, derivation of reliability functions, Failure rate, Hazard rate, mean time t future & their relations, concepts of fault tolerant analysis, Elementary idea about decision theory and goal programming.	Usage of ICT like PPT, Video Lectures, Black board.

COURSE OUTCOME:

Knowledge in the technical, methodology of solving Partial Differential Equations. A basic understanding in the Transforms which are useful in solving engineering problems. The curriculum of the Department is designed to satisfy the diverse needs of students. Coursework is designed to provide students the opportunity to learn key concept of Applications of probability, stochastic process, Queuing system, fuzzy sets and reliability.

Reference Books:

•Higher Engineering Mathematics B.V. Ramana Tata Mc Hill
•Advance Engineering Mathematics Ervin KreszigWiley EastenEdd
•Applied Numerical Methods with MATLAB Steven C ChapraTMH

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
	Understand the concept of probability and MATLAB	GOAL-4(quality Education)	

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SEMESTER- 1st
Course: M. Tech VLSI
SUBJECT: CMOS VLSI Design

Subject Code: 6TMVD102
Theory Max. Marks: 50
Theory Min. Marks: 17

COURSE OBJECTIVE:

- Introduce the technology, design concepts, electrical properties and modelling of Very Large-Scale Integrated circuits.
- Basics of MOS Circuit Design & modelling
- Basics of MOS process Technology
- Understand the concepts of modelling a digital system using Hardware Description Language.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	VLSI design methodologies: VLSI Design flow, Design Hierarchy, Regularity, Modularity and Locality, VLSI design styles, Design quality, Packaging technology MOS device design equations, Second order effects, the complementary CMOS Inverter DC characteristics.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – II	Circuit Characterization and Performance Estimation: Parasitic effect in Integrated Circuits, Resistance estimation, capacitance estimation, Inductance. Switching characteristics, CMOS Gate transistor sizing, Power dissipation, CMOS Logic Structures, Clocking Strategies.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – III	CMOS Process Enhancement and Layout Considerations: Interconnect, circuit elements, stick diagram, Layout design rules, Latch up, latch up triggering, latch up prevention, Technology related CAD issues.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – IV	Subsystem Design: Structured design of combinational logic- parity generator, multiplexer, code converters. Clocked sequential circuits- two phase clocking, charge storage, dynamic register element, and dynamic shift register. Subsystem design process, Design of ALU subsystem, Adders, Multipliers. Commonly used storage/ memory elements.	Usage of ICT like PPT, Video Lectures, Black board.
Unit - V	Field Programmable Devices: Definitions of Relevant Terminology, Evolution of Programmable Logic Devices, User- Programmable Switch Technologies, Computer Aided Design (CAD) Flow for FPDs, Programmable Logic, Programmable Logic Structures, Programmable Interconnect, Reprogrammable Gate Array, Commercially Available SPLDs, CPLDs and FPGAs, Gate Array Design, Sea-of-Gates.	Usage of ICT like PPT, Video Lectures, Black board.

COURSE OUTCOME:

- Students will demonstrate knowledge of mathematics, science and engineering.
- Students will demonstrate the ability to identify, formulate and solve engineering problems.
- Students will demonstrate the ability to design and conduct experiments, analyze and interpret data
- Students will demonstrate the ability to design a system, component or process as per needs and specifications.
- Students will show the understanding of impact of engineering solutions on the society and also will be aware of contemporary issues.

Reference Books:

- Basic VLSI Design D.A. Pucknell, K. EshraghianPHI, 3rd Ed
- Introduction to VLSI Circuits and Systems John P. Uyemura John Wiley & Sons
- Principles of CMOS VLSI Design Niel H.E. Weste ,K. EshraghianPerson, 2nd Ed

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity

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Design Engineer, CAD Engineer, Product Engineer, Verification Engineer, FPGA Design Engineer	Able to understand VLSI design methodologies, CMOS processes, design concept of FPGA, CAD.	GOAL-4(quality Education	

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SEMESTER- 1st
Course: M. Tech VLSI
SUBJECT: Advances Logic Design

Subject Code: 6TMVD103
Theory Max. Marks: 50
Theory Min. Marks: 17

COURSE OBJECTIVE:

Advanced techniques in the design of digital systems. Hardware description languages, combinational and sequential logic synthesis and optimization methods, partitioning, mapping to regular structures. Emphasis on reconfigurable logic as an implementation medium. Memory system design. Digital communication including serial/parallel and synchronous/asynchronous methods.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Course overview; design concepts, introduction to logic circuit and Verilog Implementation technology, CMOS logic gates, programmable logic devices Optimized implementations of logic functions, canonical representations Karnaug maps, factoring, functional decomposition, NAND/NOR networks, bubble pushing.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – II	Verilog data types and operators, modules and ports, gate level modeling, time simulation/ scheduler. Circuit issues. Verilog behavioral models, number representation and arithmetic circuits, positional notation, signed numbers, arithmetic operations.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – III	Verilog specifications of combinational circuits, combinational logic building blocks encoders/decoders, arithmetic comparison, etc. The basic latch, gated SR and D latchmaster-slave and edge-triggered flip flops, counters, shift registers, Design examples introduction to finite state machines; introduction to ModelSim.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – IV	Synchronous sequential circuits, design process, state assignment, hazards, glitches, asynchronous design, Met stability, Noise margins, Power, fan-out, skew Finite statemachine design examples, Verilog representations.	Usage of ICT like PPT, Video Lectures, Black board.

COURSE OUTCOME:

- An ability to apply knowledge of mathematics, science, and engineering
- An ability to design and conduct experiments, as well as to analyze and interpret data
- An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- An ability to identify, formulate, and solve engineering problems
- An ability to use the techniques, skills, and modern engineering tools a recognition of the need for, and an ability to engage in life-long learning.

Reference Books:

- Digital Design John F. WakerlyPearson Education Asia, 3rd Ed
- Digital DesignM. M. ManoPearson Education, 3rd Ed
- Fundamentals of Logic Design C. H. Roth, JrJaico Publishing House
- An Engineering Approach to Digital DesignFletcher PHI

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity

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Hardware Logic Design Engineer, Fabrication Engineer	Able to understand the concepts of advanced logic circuits, Verilog specification of combinational circuits & sequential circuits.	GOAL-4(quality Education)	

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SEMESTER- 1st
Course: M. Tech VLSI
SUBJECT: Digital Signal Processing

Subject Code: 6TMVD104
Theory Max. Marks: 50
Theory Min. Marks: 17

COURSE OBJECTIVE:

This course will introduce the basic concepts and techniques for processing signals on a computer. By the end of the course, you be familiar with the most important methods in DSP, including digital filter design, transform-domain processing and importance of Signal Processors. The course emphasizes intuitive understanding and practical implementations of the theoretical concepts.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Introduction to Discrete Time Signals Sequences; representation of signals on orthogonal basis; Sampling and Reconstruction of signals.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – II	Discrete Systems Attributes; Z-Transform; Analysis of LSI systems; Frequency analysis; Inverse systems, Discrete Fourier Transform (DFT), Fast Fourier Transform algorithms, Implementation of discrete time systems.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – III	Design of FIR Digital Filters Window method, Park-McClellan's method; Effect of f register length in FIR filter Design.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – IV	Design of IIR Digital Filters Butterworth, Chebyshev and Elliptic Approximations; Lowpass, Bandpass, Bandstop and pass filters	Usage of ICT like PPT, Video Lectures, Black board.
Unit - V	Introduction to VLSI DSP Transformations for high-speed using pipelining, retiming, parallel processing, and folding techniques; Design of programmable DSPs.	Usage of ICT like PPT, Video Lectures, Black board.

COURSE OUTCOME:

By the end of the course the student will be able to:

- Represent discrete-time signals analytically and visualize them in the time domain.
- Understand the meaning and implications of the properties of systems and signals.
- Understand the Transform domain and its significance and problems related tom computational complexity.
- Be able to specify and design any digital filters using MATLAB.

Reference Books:

- Discrete Time Signal Processing A.V. Oppenheim and Schafer Prentice Hall, 1989
- Digital Signal Processing: Principle,
- Algorithms and Applications John G. Proakis and D.G.ManolakisPrentice Hall, 1997
- Theory and Application of Digital Signal Processing L.R. Rabiner andB. Gold Prentice Hall, 1992
- VLSI Digital Signal Processing Systems Design and Implementation K.K. ParhiWiley

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Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Filter Design Engineer, DSP Engineer	Able to design FIR Digital Filters & IIR Digital Filters, understand the concept of signals & systems and their transformation methods	GOAL-4(quality Education)	

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SEMESTER- 1st
Course: M. Tech VLSI
SUBJECT: Embedded Microcontroller Programming

Subject Code: 6TMVD105
Theory Max. Marks: 50
Theory Min. Marks: 17

COURSE OBJECTIVE:

- Recognize and identify the constraints facing embedded system designers, and determine How to assess them.
- Program a modern microcontroller in assembly language and operate its peripheral devices.
- Interpret how the assembly code generated by a compiler relates to the original C code.
- Practice thread-based program design.
- Develop programs controlling embedded systems using quick and efficient methods.
- Predict measure and manipulate a program's execution time.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Embedded System Overview: Embedded System definition. Processor Technology: General purpose, Single Purpose, Application Specific, Super scalar, Pipelined, Very Long Instruction Word (VLIW) Processor, Microprocessors, Micro controllers and DSP Processors. Embedded Processors in VLSI circuit.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – II	Architectural Issues: CISC, RISC, DSP and Harvard/Princeton Architectures. Memory: ROM, EPROM, EEPROM, FLASH, RAM, SRAM, DRAM, SDRAM, NVRAM, EDORAM, DDRRAM, Memory Hierarchy and Cache. Interfacing: Interfacing using Glue Logic, Interrupt, DMA, I/O Bus structure, I/O devices, Serial Communication Protocols, Parallel Communication Protocols, Wireless Protocols.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – III	Introduction to 8-bit Microcontrollers e.g. 8051, 68HC11, 80196, Timers/Counters, USART. Detailed study of 8051 microcontroller, with its programming in assembly language and Interrupts, Serial Programming etc.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – IV	Interfacing of Microcontroller such as SPI, PWM, WDT, Input Capture, Output Compare Modes, Interfacing LED, Switches, ADC, DAC, LCD, RTC. Idea about the C programming of Microcontroller. I2C, CAN bus architecture.	Usage of ICT like PPT, Video Lectures, Black board.
Unit - V	Introduction to 16/32-bit microcontrollers. Introduction to ARM Architecture and Organization, Difference between ARM7, ARM9 & ARM11 TDMI, ARM programming model, ARM Instruction set.	Usage of ICT like PPT, Video Lectures, Black board.

COURSE OUTCOME:

- Understand what is a microcontroller, microcomputer, embedded system.
- Understand different components of a micro-controller and their interactions. Become familiar with programming environment used to develop bedded systems
- Understand key concepts of embedded systems like IO, timers, interrupts, interaction with peripheral device
- Learn debugging techniques for an embedded system.

Reference Books:

- Microcontrollers (Architecture, Programming, Interfacing and System

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•Design)Dr. RajkamalPearson Education
•8051 Microcontroller and Embedded System M. A. Mazidi& J. G. MazidiPearson Education Asia
•Embedded SystemsDr. RajKamal TMH
•An Embedded Software Primer David E. Simon Pearson Education

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Embedded Project Design Engineer	Understand the concept of embedded system, able to design project using 8-bit/ 16-bit/ 32- bit microcontroller, & also get the concept of ARM processor.	GOAL-4(quality Education)	LED Sign Board Manufacturers

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Subject Code: 6TMVD106

SEMESTER- 1st
Course: M. Tech VLSI
SUBJECT: English paper for Research Writing

COURSE OBJECTIVE:

•Understand that how to improve your writing skills and level of readability.
•Learn about what to write in each section.
•Understand the skills needed when writing a title.
•Ensure the good quality of paper at very first-time submission.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Planning and Preparation, Word Order, breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness	Usage of ICT like PPT, Video Lectures, Black board.
Unit – II	Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts and Introduction.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – III	Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check	Usage of ICT like PPT, Video Lectures, Black board.
Unit – IV	Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature.	Usage of ICT like PPT, Video Lectures, Black board.
Unit - V	Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions.	Usage of ICT like PPT, Video Lectures, Black board.
Unit - VI	Useful phrases, how to ensure paper is as good as it could possibly be the first-time submission.	Usage of ICT like PPT, Video Lectures, Black board.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
	Able to understand the concept of writing research paper	GOAL-4(quality Education)	project developer

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SEMESTER- 1st **Subject Code: 6TMVD106**

Course: M. Tech VLSI

SUBJECT: Pedagogy Studies

COURSE OBJECTIVE:

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Introduction and Methodology: • Aims and rationale, Policy background, Conceptual framework and terminology • Theories of learning, Curriculum, Teacher education. • Conceptual framework, Research questions. • Overview of methodology and Searching.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – II	• Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. • Curriculum, Teacher education.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – III	• Evidence on the effectiveness of pedagogical practices • Methodology for the in depth stage: quality assessment of included studies. • How can teacher education (curriculum and practicum) and the school Curriculum and guidance materials best support effective pedagogy? • Theory of change. • Strength and nature of the body of evidence for effective pedagogical practices. • Pedagogic theory and pedagogical approaches. • Teachers' attitudes and beliefs and Pedagogic strategies.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – IV	• Professional development: alignment with classroom practices and follow up • support • Peer support. • Support from the head teacher and the community. • Curriculum and assessment • Barriers to learning: limited resources and large class sizes.	Usage of ICT like PPT, Video Lectures, Black board.
Unit - V	Research gaps and future directions • Research design • Contexts. • Pedagogy. • Teacher education. • Curriculum and assessment. • Dissemination and research impact.	Usage of ICT like PPT, Video Lectures, Black board.

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Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
	Able to understand the concept of research gap and future scope	GOAL-4(quality Education)	

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Subject Code: 6TMVD106

SEMESTER- 1st
Course: M. Tech VLSI
SUBJECT: Stress Management by Yoga

COURSE OBJECTIVE:

•To achieve overall health of body and mind.
•To overcome stress.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Definitions of Eight parts of yog. (Ashtanga)	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit – II	Yam and Niyam. Do`s and Don't's in life. i) Ahinsa, satya, astheya, bramhacharya and aparigraha ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit – III	Asan and Pranayam i) Various yog poses and their benefits for mind & body ii) Regularization of breathing techniques and its effects-Types of pranayam.	Classroom teaching, ICT Based and individual presentation and Google classroom

COURSE OUTCOME:

Students will be able to:

•Develop healthy mind in a healthy body thus improving social health also
•Improve efficiency

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
	Understand the benefits of yoga for body and mind	GOAL-4(quality Education)	

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Semester: M.Tech I st sem
Subject: VLSI Lab
Total Marks in End Semester Exam. : 75
Total Lab Periods: 40

Branch: Electronics & communication
Code: 6TMVD107

List of Experiments (to be performed at least 10 experiments)

1) To design and simulate the basic gates
2) Designing of the combinational blocks
a) Mux b) Encoders c) Decoders
3) Designing and simulation of Code converters
4) Designing, simulation and implementation 9-bit parity generator/checker
5) Designing, simulation and implementation Flip-Flops
6) Designing and simulation of Registers
7) Designing and simulation of Counters
8) FSM modeling (Design Sequence Detector "101")
9) Designing, simulation and implementation of ROM
10) Designing, simulation and implementation of RAM
11) Designing, simulation and implementation of FIFO
12) Design, simulation and implementation of ALU
13) Designing and simulation of Filter
14) Designing and simulation of FSK modulator and Demodulator
15) Designing and simulation of PN generator.

List of Equipment's/Machine Required:

1) Computer System with Pentium 4 processor, 256MB Ram
2) EDA tools:
1)FPGA implementation kit
2)CPLD implementation kit
3)Xilinx project navigator 5.2
4)Active HDL 6.2
5)Modelsim

Recommended Books:

1) Fundamentals of Digital Logic with VHDL Design: Brown Vranesic, TMH Publication.
2) Circuit Design with VHDL Prdroni PHI Publication
3) VHDL Primer Bhaskar PHI Publication

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Semester: M.Tech I st sem
Subject: Embedded System Design Lab
Total Practical Periods: 40
Total Marks in End Semester Exam -75

Branch: Electronics & communication
Code: 6TMVD108

List of experiments to be performed:

- Create, compile and test a program to print a string a message on standard output device
- Create a program to print powers of 2 from 2^0 to 2^{12}
- Write a program that continuously reads Port A and provides output to port B
- Use External Hard ware Interrupt to print a message to the standard output devices each time an interrupt occurs. Also print number of time interrupt occur
- Create a program that will turn on an LED when falling edge occur on external interrupt 0 and turn it off when rising edge occur on external interrupt 1
- Create a programme that will demonstrate how watchdog timer resets the processor if programme hangs up to infinite loop
- Create a programme that will read the data on all 8 bits of port B swap the nibble of data and send it to port A
- Create a simulated engine speed monitor that will light a LED if the motor speed drops below 200rpm and another LED if motor speed exceeds 500 rpm and light another LED if motor speed between 200 to 500 rpm
- Create a programme to output the ASCII character G every 50 msec via USART at 9600 baud rates
- Write a microcontroller 8051 program to add two floating-point numbers.
- Write a microcontroller 8051 program to multiply two floating-point numbers.
- Write a microcontroller 8051 program that generates 2kHz square wave on pin P1.0, 2.5 kHz on pin P1.2 and 25 Hz on pin P1.3.
- Write a microcontroller 8051 program for counter 1 in mode 2 to count the pulses and display the state o the TL1 count on P2. Assume that the clock pulses are fed to pin T1.
- Write a microcontroller 8051 program to transfer word "COMMUNICATION" serially at 4800 baud and one stop bit, to the com port of PC continuously.
- Write a microcontroller 8051 program to receive bytes of data serially, and put them in P1. Set the baud rate at 2400 baud, 8-bit data, and 1 stop bit. Assume crystal frequency to be 11.0592 MHz.

- **Recommended Books:**

- Embedded C Programming and the Microchip by PIC Barneet , Cox ,O'cull Thomson publication
- Embedded system by Raj Kamal TMH

- **List of Equipments/Machine Required :**

- MATLAB Software with Simulink
- Emulation software with Cross C complier

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SEMESTER- 2nd
Course: M. Tech VLSI
SUBJECT: VLSI Technology

Subject Code: 6TMVD201
Theory Max. Marks: 50
Theory Min. Marks: 17

COURSE OBJECTIVE:

The course is designed to give the student an understanding of the different design steps required to carry out a complete digital VLSI (Very-Large-Scale Integration) design in silicon.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Overview of Semiconductor Processing: Electronic grade silicon preparation, Crystal growth, Czochralski process, wafer-preparation, slicing, Marking, polishing, evaluation. Basic wafer fabrication operations, wafer sort, clean room construction and maintenance.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – II	Oxidation: Objectives, Silicon dioxide layer uses, Thermal oxidation mechanism and methods, Kinetics of oxidation, Deal Grove model, Oxidation processes, post oxidation evaluation.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – III	Basic Patterning: Overview of Photo-making process, Ten step process, Basic photo resist chemistry, comparison of positive and negative photo resists, X-ray lithography, Electron beam exposure system.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – IV	Doping: Definition of a junction, Formation of doped region and junction by diffusion, diffusion process steps, deposition, drive-in-oxidation, Ion implantation-concept and system, implant damage, Comparison of diffusion and ion-implantation techniques.	Usage of ICT like PPT, Video Lectures, Black board.
Unit - V	Deposition: Chemical Vapor Deposition (CVD), CVD Process steps, CVD System types, Low-Pressure CVD (LPCVD), Plasma-enhanced CVD (PECVD), Vapor Phase Epitaxy (VPE), Molecular Beam Epitaxy (MBE), Metalorganic CVD (MOCVD), SOS (Silicon on Sapphire) and SOI (silicon on Insulator). Brief Introduction to Metallization.	Usage of ICT like PPT, Video Lectures, Black board.

COURSE OUTCOME:

•Be able to use mathematical methods and circuit analysis models in analysis of CMOS digital electronics circuits, including logic components and their interconnect.
•Be able to create models of moderately sized CMOS circuits that realize specified digital functions.
•Be able to apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect, and to verify the functionality, timing, power, and parasitic effects.
•Have an understanding of the characteristics of CMOS circuit construction and the comparison between different state-of-the-art CMOS technologies and processes.
•Be able to complete a significant VLSI design project having a set of objective criteria and design constraints.

Reference Books:

•VLSI Technology S.M. Sze McGraw-Hill, 2nd Ed
•VLSI Fabrication Principles S. K. Gandhi Wiley
•Silicon Semiconductor Technology W. R. Runyan McGraw-Hill

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Fabrication Engineer, Service Engineer, Design Engineer	Understand the concept of Semiconductor processing, Oxidation, Basic patterning, Doping, Deposition	GOAL-4(quality Education)	

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SEMESTER- 2nd
Course: M. Tech VLSI
SUBJECT: Real Time Operating System

Subject Code: 6TMVD202
Theory Max. Marks: 50
Theory Min. Marks 17

COURSE OBJECTIVE:

To introduce the basic concepts of Embedded Systems and the various techniques used for Embedded Systems with real time examples.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Introduction to OS, Process Management & Inter Process Communication. Memory management, I/O subsystem, File System Organization.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – II	(a) Real Time Systems Concepts: Foreground/Background Systems, Critical Section of Code, Resource, Shared resource, Multitasking, task, context switch, Kernel, Schedules, Primitive & Non-Primitive Kernel, various scheduling methods. (b) Real Time Scheduling. Real-Time task scheduling: Clock-driven, Event-driven, Scheduling of real-time task on a uniprocessor. Rate Monotonic Analysis (RMA), Earliest Deadline First (EDF), and Scheduling with limited priority levels.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – III	Kernel structure, Task scheduling, Task management, Resource sharing among tasks, Priority inversion problem, Priority inheritance protocol An overview of scheduling in multiprocessor and distributed systems.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – IV	Performance Metrics of RTOS, Programming in VxWorks, or COS-II Overview of C/OS- Overview of some other commercial embedded operating systems: PSOS, VRTX, RT Linux, WinCE. Benchmarking real-time operating systems.	Usage of ICT like PPT, Video Lectures, Black board.
Unit - V	Commercial real-time operating systems: Unix as a real-time operating system, Windows as a real-time operating system, Extensions to Unix: Host target approach, Pre-emption points, fully preempt able kernel.	Usage of ICT like PPT, Video Lectures, Black board.

COURSE OUTCOME:

- To discuss the basics o embedded systems and the interface issues related to it.
- To learn the different techniques on embedded systems.
- To discuss the real time models, languages and operating systems.
- To analyze real time examples.

Reference Books:

- An Embedded Software Primer David E. Simon Pearson Education
- Real time Systems, Theory and practices Dr. Rajib Mall Pearson Education

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Embedded Software Engineer, RTOS Engineer	Able to understand the design concept of RTOS	GOAL-4(quality Education)	

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SEMESTER- 2nd
Course: M. Tech VLSI
SUBJECT: VLSI Test & Testability

Subject Code: 6TMVD203
Theory Max. Marks: 50
Theory Min. Marks: 17

COURSE OBJECTIVE:

The objective of this course is to provide students with a sound knowledge of VLSI systems covering the following:

•Processor architectures, memory organization and performance analysis, and concepts and techniques for parallel processing and pipeline processing.
•High-speed synchronization design and system noise consideration.
•VLSI system design verification and testability, and system reliability.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Introduction to Testing Process: CMOS Testing, Reliability, Failures & Faults, Levels of Testing, Test economics, Elementary Testing Concepts, System and Field Testing, Burn in boards.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – II	Logic Simulation & Fault modelling: Delay Models, Event driven simulation, general fault emulation, fault detection and redundancy, fault equivalence and fault dominance. Stuck-at faults, bridging faults, transistor faults, delay faults etc. Fault detection using Boolean Difference, Path Sensitization. Fault Collapsing.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – III	Test generation for combinational & sequential circuits: D-algorithm, PODEM, SPOOF. Automatic Test Pattern Generation. Primitive and Propagation Cubes. Fan-out Oriented Test Generation. Controllability and Observe ability. Testing of sequential circuits as iterative combinational circuits, state table verification, random testing.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – IV	Design for testability: Ad-hoc methods, Full scan & Partial scan design. Boundary scans. Testability analysis.	Usage of ICT like PPT, Video Lectures, Black board.
Unit - V	Built-in self-test & IDDQ testing: RAM BIST, Logic BIST Random and weighted random pattern testability BIST Pattern generator and response analyzer Scan-based BIST architecture Test point insertion for improving random testability. IDDQ testing, IDDQ test patterns, IDDQ measurement Case studies, Design for IDDQ testability.	Usage of ICT like PPT, Video Lectures, Black board.

COURSE OUTCOME:

After the completion of this course, the students are able to:
•Acquire knowledge about fault modeling and collapsing.
•Learn about various combinational atpg.
•Understand sequential test pattern generation.
•Use various verification techniques.

Reference Books:

•Fault Tolerant and Fault Testable Hardware Design Parag K. Lala BS Publication
•Principles of CMOS VLSI design N. Weste and K. Eshraghian Addison-Wesley

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Service Engineer	Understand the concept of VLSI Testing process with respect to combinational & sequential circuits, get the understanding of design for testability, Built-in self-test & IDDQ testing.	GOAL-4(quality Education)	

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SEMESTER- 2nd
Course: M. Tech VLSI
SUBJECT: Embedded Computing System Design

Subject Code: 6TMVD204
Theory Max. Marks: 50
Theory Min. Marks: 17

COURSE OBJECTIVE:

Main objectives of the course are:
•Introduction of the real-time systems.
•Computing required for the real-time embedded systems.
•Communication required for the real-time embedded systems.
•Present an overview of the real-time embedded systems in practice.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Introduction: Embedding Complex Systems and Microprocessors Embedded System Design Process, Designing Hardware and Software Components, Formalization of System Design, Application Examples.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – II	Instruction Sets: Assembly Language, ARM processor and memory organization. DataOperations and Control of Flow. SHARC Processor, Memory organization, Data Operations and flow control, Parallelism within the instructions.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – III	CPUs: Performance, Power Dissipation, Design Example, Data Compression. CPU Bus Protocols in ARM, Design, Development and Debugging.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – IV	Program design and Analysis: Program Design, Models of Program, Assembling, Linking, Compiling, Analysis and optimization of the Program Size and Execution times. Design Example: Software Modem.	Usage of ICT like PPT, Video Lectures, Black board.
Unit - V	System Design Techniques: Design Methodologies, Requirement Analysis, Specifications, System Analysis, quality Assurance, Two Design Examples in Networking and Internet Enabled Systems and Automobile Applications.	Usage of ICT like PPT, Video Lectures, Black board.

COURSE OUTCOME:

After completing these course students shall be able:
•To present the mathematical model of the system.
•To develop real-time algorithm for task scheduling.
•To understand the working of real-time operating systems and real-time database.
•To work on design and development of protocols related to real-time communication.

Reference Books:

•Computers as Components Wayne Wolf Harcourt India Private Ltd

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Embedded Engineer	Get the concept of real-time embedded system, Instruction set, Assembly language, CPUs, Program Design & Analysis, System Design Techniques.	GOAL-4(quality Education)	

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SEMESTER- 2nd
Course: M. Tech VLSI
SUBJECT: Micro Electronics

Subject Code: 6TMVD205
Theory Max. Marks: 50
Theory Min. Marks: 17

COURSE OBJECTIVE:

•Understand how to approach analysis and design of circuits with nonlinear elements, including diodes, BJTs & MOSFETs with an emphasis on design-oriented analysis techniques.
•Understand the principles of operation for pn junctions, semiconductor diodes, MOSFETs and BJTs, including intuition behind the physical meaning of device model parameters and limitations of models.
•Understand how to analyze and design basic amplifier gain stages and digital logic gates using MOSFETs and BJTs.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Review of quantum mechanics theory. Motion of electron in a periodic lattice. Band theory of solids, effective mass, holes.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – II	Statistics of carriers in semiconductors. Lifetime and recombination theory. Boltzmann transports equation. Carrier transport in semiconductors, including high field effect.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – III	P-N junction theory. Excess currents and breakdown in p-n junctions. Bipolar transistors. Ebers-Moll and small signal models. Switching characteristics. Non uniformly doped transistors. High current and high frequency effects.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – IV	Introduction to IC Technology, overview of MOS & BJT, Threshold voltage, Body effect, basic DC equations, 2nd order effects, MOS Model, Small Signal AC Characteristics, CMOS Inverter & its DC Characteristics, Static load MOS Inverter.	Usage of ICT like PPT, Video Lectures, Black board.

COURSE OUTCOME:

After taking this course students will be able to recognize and use the following concepts, ideas, and/or tools:
•Small-signal analysis of circuits with diodes, and BJT
•Large-signal analysis of circuits with diodes, and BJTs
•Design oriented analysis of microelectronic electronic circuit.

Reference Books:

•Physics of Semiconductors J.L. Moll McGraw Hill
•Introduction to Solid State Electronics F.Y. Wang North Holland
•Physics of Semiconductor Devices S.M. Sze Weiley Easter
•Dipolar Semiconductors Devices D.J. Roulston McGraw Hill

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
	Understand the design concept of P-N diode, BJT, MOS, Ability to utilize electronic calibration and testing equipment. Able to get the knowledge of IC Technology.	GOAL-4(quality Education)	

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SEMESTER- 2nd **Subject Code:6TMVD206**
Course: M. Tech VLSI
SUBJECT: Disaster Management

COURSE OBJECTIVE:

Students will be able to:

•Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
•Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
•Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
•Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Introduction Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – II	Repercussions of Disasters and Hazards: Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – III	Disaster Prone Areas in India Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics Disaster Preparedness and Management Preparedness: Monitoring of Phenomena Triggering A Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – IV	Risk Assessment Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.	Usage of ICT like PPT, Video Lectures, Black board.
Unit - V	Disaster Mitigation Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India. Dissemination and research impact.	Usage of ICT like PPT, Video Lectures, Black board.

COURSE OUTCOME:

•To get a working knowledge in illustrious Sanskrit, the scientific language in the world
•Learning of Sanskrit to improve brain functioning
•Learning of Sanskrit to develop the logic in mathematics, science & other subjects
•Enhancing the memory power
•The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
	Understand the concept of risk assessment	GOAL-4(quality Education)	

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Subject Code: 6TMVD206

SEMESTER- 2nd
Course: M. Tech VLSI
SUBJECT: Personality Development through life enlightenment skills

COURSE OBJECTIVE:

•To learn to achieve the highest goal happily.
•To become a person with stable mind, pleasing personality and determination.
•To awaken wisdom in students.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Neetisatakam-Holistic development of personality • Verses- 19,20,21,22 (wisdom) • Verses- 29,31,32 (pride & heroism) • Verses- 26,28,63,65 (virtue) • Verses- 52,53,59 (dont's) • Verses- 71,73,75,78 (do's)	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit – II	• Approach to day to day work and duties. • Shrimad BhagwadGeeta : Chapter 2-Verses 41, 47,48, • Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35, • Chapter 18-Verses 45, 46, 48	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit – III	• Statements of basic knowledge. • Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 • Chapter 12 -Verses 13, 14, 15, 16,17, 18 • Personality of Role model. Shrimad Bhagwad Geeta: • Chapter2-Verses 17, Chapter 3-Verses 36,37,42, • Chapter 4-Verses 18, 38,39 • Chapter18 – Verses 37,38,63	Classroom teaching, ICT Based and individual presentation and Google classroom

COURSE OUTCOME:

Students will be able to
•Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
•The person who has studied Geeta will lead the nation and mankind to peace and prosperity
•Study of Neetishatakam will help in developing versatile personality of students.

Suggested reading:

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication
2. Department), Kolkata
3. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath,
4. Rashtriya Sanskrit Sansthanam, New Delhi.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
	Understand the concept of day-to-day work & duty.	GOAL-4(quality Education)	

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Subject Code: 6TMVD206

SEMESTER- 2nd
Course: M. Tech VLSI
SUBJECT: Value Education

COURSE OBJECTIVE:

Students will be able to
•Understand value of education and self- development.
•Imbibe good values in students.
•Let the should know about the importance of character.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	• Values and self-development –Social values and individual attitudes. • Work ethics, Indian vision of humanism. • Moral and non- moral valuation. Standards and principles. • Value judgements	Usage of ICT like PPT, Video Lectures, Black board.
Unit – II	• Importance of cultivation of values. • Sense of duty. Devotion, Self-reliance. Confidence, • Concentration. Truthfulness, Cleanliness. • Honesty, Humanity. Power of faith, National Unity. • Patriotism Love for nature, Discipline	Usage of ICT like PPT, Video Lectures, Black board.
Unit – III	• Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. • Punctuality, Love and Kindness. • Avoid fault Thinking. • Free from anger, Dignity of labor. • Universal brotherhood and religious tolerance. • True friendship. • Happiness Vs suffering, love for truth. • Aware of self-destructive habits. • Association and Cooperation. • Doing best for saving nature.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – IV	• Character and Competence –Holy books vs Blind faith. • Self-management and Good health. • Science of reincarnation. • Equality, Nonviolence, Humility, Role of Women. • All religions and same message. • Mind your Mind, Self-control. • Honesty, Studying effectively	Usage of ICT like PPT, Video Lectures, Black board.

COURSE OUTCOME:

Students will be able to:

- Knowledge of self-development.
- Learn the importance of Human values.
- Developing the overall personality.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
	Understand the concept of work ethics	GOAL-4(quality Education)	

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Semester: M. Tech II
Subject: VLSI Test & Testability
Total Practical Periods: 40
Total Marks in end Semester Exam

Branch: Electronics & communication
Code: 6TMVD207

List of Practical

1) Simulation of basic Logic Gates
2) Simulation of Half Adder and Full Adder
3) Simulation of Half Subtractor and Full Subtractor
4) Simulation of Multiplexer and Demultiplexer
5) Simulation of Encoder and Decoder
6) Simulation of Arithmetic Logic Unit
7) Simulation of 8- bit adder
8) Simulation of 5-bit multiplier
9) Simulation of D Flip Flop and D Latch
10) Simulation of Pseudo Random Binary Sequence
11) Simulation of Accumulator
12) Simulation of Up-Down Counter
13) Implementation of CMOS Inverter layout in Microwind
14) Implementation of CMOS NAND gate layout in Microwind

List of Equipment's/Machine Required:

1) Computer System with Pentium 4 processor, 256MB Ram
2) EDA tools:
   a. FPGA implementation kit
   b. CPLD implementation kit
   c. Xilinx project nevigator 5.2
   d. Active HDL 6.2
   e. Modelsim

Recommended Books:

1) Fundamentals of Digital Logic with VHDL Design: Brown Vranesic, TMH Publication.
2) Circuit Design with VHDL Prdroni PHI Publication
3) VHDL PrimerBhaskar PHI Publication

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KARGI ROAD, KOTA, BILASPUR (C.G.)

Semester: M. Tech II **Branch: Electronics & communication**
Subject: VLSI Technology Lab **Code: 6TMVD208**
Total Practical Periods: 50
Total Marks in end Semester Exam

Experiments to be performed

PART – A -DIGITAL DESIGN

1. Write Verilog Code for the following circuits and their Test Bench for verification, observe the waveform and synthesis the code with technological library with given Constraints*. Do the initial timing verification with gate level simulation.

i. An inverter
ii. A Buffer
iii. Transmission Gate
iv. Basic/universal gates
v. Flip flop -RS, D, JK, T
vi. Serial & Parallel adder
vii. 4-bit counter [Synchronous and Asynchronous counter]
viii. Successive approximation register [SAR]

PART – B- ANALOG DESIGN

1. Design an Inverter with given specifications*, completing the design flow mentioned below:
   a. Draw the schematic and verify the following
   i) DC Analysis
   ii) Transient Analysis
   b. Draw the Layout and verify the DRC, ERC
   c. Check for LVS
   d. Extract RC and back annotate the same and verify the Design
   e. Verify & Optimize Time, Power and Area to the given constraint***

2. Design the following circuits with given specifications*, completing the design flow mentioned below:
   a. Draw the schematic and verify the following
   i) DC Analysis
   ii) AC Analysis
   iii) Transient Analysis
   b. Draw the Layout and verify the DRC, ERC
   c. Check for LVS
   d. Extract RC and back annotate the same and verify the Design.
   i) A Single Stage differential amplifier
   ii) Common source and Common Drain amplifier

3. Design an op-amp with given specification* using given differential amplifier Common source and Common Drain amplifier in library** and completing the design flow mentioned below:
   a. Draw the schematic and verify the following

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i) DC Analysis
ii) AC Analysis
iii) Transient Analysis
b. Draw the Layout and verify the DRC, ERC
c. Check for LVS
d. Extract RC and back annotate the same and verify the Design.

4. Design a 4 bit R-2R based DAC for the given specification and completing the design flow mentioned using given op-amp in the library**.

a. Draw the schematic and verify the following
i) DC Analysis
ii) AC Analysis
iii) Transient Analysis
b. Draw the Layout and verify the DRC, ERC
c. Check OF LVS
d. Extract RC and back annotate the same and verify the Design.

5. For the SAR based ADC mentioned in the figure below draw the mixed signal schematic and verify the functionality by completing ASIC Design FLOW.

List of Equipment's/Machine Required:

1) Computer System with Pentium 4 processor, 256MB Ram
2) EDA tools:
a. FPGA implementation kit
b. CPLD implementation kit
c. Xilinx project nevigator 5.2
d. Active HDL 6.2
e. Modelsim

Recommended Books:

1) Fundamentals of Digital Logic with VHDL Design: Brown Vranesic, TMH Publication.
2) Circuit Design with VHDL Prdroni PHI Publication
3) VHDL Primer Bhaskar PHI Publication

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SEMESTER- 3rd
Course: M. Tech VLSI
SUBJECT: Opto-Electronics Integrated Circuits

Subject Code: 6TMVD301 (A)
Theory Max. Marks: 50
Theory Min. Marks: 17

COURSE OBJECTIVE:

This course provides a complete overview of the wide variety of different semiconductor optoelectronic devices employed in light wave systems and networks. Topics include a variety of different subjects including a detailed discussion of the design and operation of optical LEDs, the basic physics and operation of lasers and photo detectors, details of the basic physics and operation of solar cells, the operation of quantum well electro-absorption modulators and electro- optic modulators, and the design and operation of optoelectronic integrated circuits. Emphasis is on the underlying device physics behind the operation and design of optoelectronic devices.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Theory of Optical Wave guides: Wave guide theory: one dimensional planar wave guides, two-dimensional wave guides, transcendental equations, wave guide modes, mode cut off conditions.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – II	Optical Wave guide Fabrication and Characterization: Waveguide fabrication: deposited films; vacuum-deposition and solution-deposition, diffused waveguides, ion- exchange and ion-implanted waveguides, epitaxial growth of III-V compound semiconductor materials, shaping of waveguides by wet and dry etching techniques. Waveguide characterization: surface scattering and absorption losses, radiation and bending losses, measurement of waveguide loss, waveguide profiling.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – III	Fundamentals of Optical Coupling: Transverse couplers. Prism couplers. Grating couplers. Fiber to waveguide couplers. Coupling between optical waveguides. Directional couplers. Applications of directional couplers.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – IV	Guided Wave Modulators and Switches: Physical effects used in light modulators: electro-optic, acousto-optic and magneto-optic effects. Waveguide modulators and switches.	Usage of ICT like PPT, Video Lectures, Black board.
Unit - V	Semiconductor Lasers and Detectors: Laser diodes. Distributed feedback lasers. Integrated optical detectors.	Usage of ICT like PPT, Video Lectures, Black board.

COURSE OUTCOME:

- Acquire fundamental understanding of the basic physics behind optoelectronic devices.
- Develop basic understanding of light emitting diodes.
- Develop detailed knowledge of laser operating principles and structures.
- Acquire in depth understanding of photo detectors.
- Acquire detailed knowledge of solar cells and optoelectronic modulation and switching devices.
- Develop basic understanding of optoelectronic integrated circuits.

Reference Books:

- Guided Wave Optoelectronics T Tamir Springer-Verlag, 1990
- Optical Guided Waves and Devices R Sysm& J Cozens McGraw-Hill, 1993

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Opto-Electronics Engineer	Understand the concept of optical waveguide, its fabrication & characteristics, Get the knowledge of Optical coupling, Modulator, Switches, Semiconductor Lasers & Detectors	GOAL-4(quality Education)	

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SEMESTER- 3rd
Course: M. Tech VLSI
SUBJECT: System on Chip (SOC) Design

Subject Code: 6TMVD301 (B)
Theory Max. Marks: 50
Theory Min. Marks: 17

COURSE OBJECTIVE:

- To design combinational logic functions and analyze delay and testability properties of interconnect and gates.
- To learn optimization of power in sequential logic machines
- To study the design principles of FPGA and PLA.
- To learn various floor planning methods for system design.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Recent advances in semiconductor technology, Programmable logic devices, such as field programmable gate arrays (FPGAs), Programmable chip architectures, logic synthesis, SoC concepts, and the Verilog synthesizable subset, Implementation of a complex system on a single programmable chip.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – II	Tools and techniques for designing, verifying and implementing System-on-Chip (SoC) designs using programmable logic. Embedded system applications and their system-level hardware-software co-design.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – III	Implementation Aspects: Adders, ALUs, Multipliers, Dividers, Register Files, Buses, CISC/RISC, Memory hierarchy (caches, MMU, main memory)	Usage of ICT like PPT, Video Lectures, Black board.
Unit – IV	ARM System-on-chip architecture.	Usage of ICT like PPT, Video Lectures, Black board.
Unit - V	Project Orientation: Concept to Verilog hardware description language (HDL), verification using simulation, synthesis and programmable device implementation on an FPGA development board.	Usage of ICT like PPT, Video Lectures, Black board.

COURSE OUTCOME:

- To design, logic gates with minimum size, spacing, and parasitic values.
- To design combinational logic machines with optimum power
- To design sequential logic machines with optimum power
- To study the design principles of FPGA and PLA.
- To learn various floor planning methods for system design.

Reference Books:

- 2001 – A Guide to the New Features ofthe Verilog Hardware Description Language Sutherland, Stuart Kluwer Academic Publishers, 2002, ISBN 0-7923-7568-8
- Verilog HDL Synthesis – A Practical Primer Bhasker, JStar Galaxy Publishing, Allentown PA, 1998, ISBN 0-9650391-5-3
- Verilog HDLPalnitkar, Samir Prentice Hall, 2003, 2nd Ed., ISBN 0-13-044911-3

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Design Engineer, Service Engineer	Ability to design System on chip, able to understand tools & techniques for SoC design, ARM SoC architecture, get the concept of Verilog HDL.	GOAL-4(quality Education)	

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SEMESTER- 3rd
Course: M. Tech VLSI
SUBJECT: Fundamentals and Applications of MEMS

Subject Code: 6TMVD301 (C)
Theory Max. Marks: 50
Theory Min. Marks: 17

COURSE OBJECTIVE:

- To introduce MEMS and micro fabrication
- To study the essential electrical and mechanical concepts of MEMS
- To study various sensing and actuating technique.
- To know about the polymer and optical MEMS.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Introduction to MEMS and Micro Fabrication: History of MEMS Development, Characteristics of MEMS-Miniaturization -Microelectronics integration - Mass fabrication with precision. Sensors and Actuators- Energy domain. Sensors, actuators Micro fabrication - microelectronics fabrication process-Silicon based MEMS processes- New material and fabrication processing- Points of consideration for processing. Anisotropic wet etching, Isotropic wet etching, Dry etching of silicon, Deep reactive ion etching (DRIE), and Surface micromachining process- structural and sacrificial material.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – II	Electrical and Mechanical Concepts of MEMS Conductivity of semiconductors, crystal plane and orientation, stress and strain - definition - Relationship between tensile stress and strain- mechanical properties of Silicon and thin films, Flexural beam bending analysis under single loading condition- Types of beam- longitudinal strain under pure bending -deflection of beam- Spring constant, torsional deflection, intrinsic stress, resonance and quality factor.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – III	Electrostatic and Thermal Principle Sensing and Actuation Electrostatic sensing and actuation-Parallel plate capacitor - Application- Inertial, pressure and tactile sensor parallel plate actuator- comb drive. Thermal sensing and Actuations- Thermal Sensors-Actuators- Applications Inertial, flow and infrared sensors.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – IV	Piezoresistive, Piezoelectric and Magnetic Principle Sensors and Actuator Piezoresistive sensors- piezoresistive sensor material- stress in flexural cantilever and membrane- Application-Inertial, pressure, flow and tactile sensor. Piezoelectric sensing and actuation- piezoelectric material properties-quartz- PZT-PVDF -ZnO-Application-Inertial, Acoustic, tactile, flow-surface elastic waves Magnetic actuation-Micro magnetic actuation principle- Deposition of magnetic materials-Design and fabrication of magnetic coil.	Usage of ICT like PPT, Video Lectures, Black board.
Unit - V	Polymer and Optical MEMS Polymers in MEMS- polymide-SU-8 Liquid crystal polymer (LCP) - PDMS – PMMA – Parylene- Fluorocarbon, Application-Acceleration, pressure, flow and tactile sensors. Optical MEMS- passive MEMS optical components-lenses-mirrors-Actuation for active optical MEMS.	Usage of ICT like PPT, Video Lectures, Black board.

COURSE OUTCOME:

This course provides the foundation of MEMS by principle, design, analysis, and fabrication technique. Through lecture and out-of- class assignments, students are provided learning experiences that enable them to:

- Familiarized on MEMS and micro fabrication, \and various potential application area.
- Understand the electrical, mechanical, thermal, magnetic, piezoelectric, piezoresistive concepts used in analyze and deign of MEMS sensors and Actuators.
- Understand the application of polymer material for MEMS and also understand the application of optical MEMS sensor.

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Text Books:

- Foundations of MEMS Chang Liu Pearson Indian Print, 1st Edition, 2012

Reference Books:

- RF MEMS Theory, Design and Technology Gaberiel M. RebizJohn Wiley & Sons, 2003
- Introduction to Nanotechnology Charles P. Poole and Frank J. Owens John Wiley & Sons, 2003
- Micro sensors, MI MS and Smart Devices Julian W Gardner andVijay K Varadhan John Wiley & sons, 2001

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Microsystem Engineer Microelectromechanical Systems Engineer	Get the knowledge of MEMS	GOAL-4(quality Education)	

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SEMESTER- 3rd
Course: M. Tech VLSI
SUBJECT: Communication RF IC Design

Subject Code: 6TMVD302 (A)
Theory Max. Marks: 50
Theory Min. Marks: 17

COURSE OBJECTIVE:

The objective of this course is to present the concepts of design and analysis of modern RF and wireless communication integrated circuits. Topics covered are: basic concepts in RF design, scattering parameters, modern integrated circuit technologies, fundamental limitations of speed of operation of transistors, physics of noise, impedance matching, low-noise amplifiers, mixers, oscillators, phase noise, and phase locked loops.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Basic concepts in RF Design: Analysis & Measurement Techniques. S-Parameter Models, Smith Chart Calculations.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – II	Trans-receiver Architecture for Wireless Communication Standards. Non-Linearity, Harmonics, Gain Compression, Desensitization, Cross Modulation, IMD & Inter-symbol Interface.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – III	RF IC Design concepts & Device Technologies: Low Noise Amplifiers, Mixers, Frequency Sources, Oscillators & Synthesizers, Power Amplifiers. Noises & Distortions in LNA, PA & Mixer Circuits.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – IV	PLL: Theory, Circuits, Distortion & Noises. Microwave Circuit Components & Design Concepts: Single Chip Radio Concepts, Design Issues Surrounding Systems as DECT, GSM, Blue Tooth etc. Case Studies.	Usage of ICT like PPT, Video Lectures, Black board.

COURSE OUTCOME:

It is expected that the students be able to apply the concepts and design techniques presented in this course to a wide range of applications including high-speed wireless communications and biomedical electronics.

Reference Books:

- RF Microelectronics Behzad Razavi PHI 1998
- RF Circuit Design R. Ludwig & P. Bretchko PHI 2000
- RF & Microwave Circuit Design for Wireless Communication L.E. Larson Artech House Publishers, 1997

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Design Engineer	Understand the concept of RF IC, PLL	GOAL-4(quality Education)	

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SEMESTER- 3rd
Course: M. Tech VLSI
SUBJECT: Embedded System Programming

Subject Code: 6TMVD302 (B)
Theory Max. Marks: 50
Theory Min. Marks: 17

COURSE OBJECTIVE:

To understand the basic concepts of embedded system, understanding of different types of programming languages used for embedded systems. Study of ARM based processors: architecture, programming and interfacing of ARM processor with memory & I/O devices. To discuss the features, Architecture and programming of Arduino Microcontroller, Architecture of Arduino. To study of RTOS.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Introduction to Linux Operating System. Shell Programming, Review of C-Programming and Data Structures.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – II	Overview of Embedded Systems – Sequential and Concurrent Models – Processor Solutions and Types – Types of Memory – Data Representation Formats – Usage of C in Embedded Systems –Programmers view of CPU – IO programming models – Concurrent Software Design – Scheduling – Memory Management – Mixing C & Assembly.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – III	Embedded System Design Issues, Challenges & Trends in Embedded Systems, Assemblers, Compilers, Linkers, Loaders, Debuggers, Profilers & Test Coverage Tools, Utilities like make, ranlib, objcopy & objdump etc.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – IV	Writing device drivers, Writing Time & Space Sensitive Programs, Programming in C for8051, 68HC11 and 80196 microcontrollers.	Usage of ICT like PPT, Video Lectures, Black board.

COURSE OUTCOME:

- Understanding of Embedded system, programming, Embedded Systems on a Chip (SoC) and the use of VLSI designed circuits.
- Understanding of internal Architecture and programming of ARM processor.
- Programming concepts of Arduino Microcontroller with various interfaces like memory & I/O devices and Raspberry Pi based embedded platform.
- Need of Real Time Operating System (RTOS) in embedded systems.
- Study of Real Time Operating system with Task scheduling and Kernel Objectives.

Reference Books:

- An Embedded Software Primer David E. Simon Pearson Education
- Programming Embedded Systems in C & C++ Michel Barr Shroff Publishers & Distributors Pvt. Ltd
- Embedded System Design: A Unified
- Hardware/Software Introduction Frank Vahid and Tony Givargis John Wiley & Sons, 2002.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Embedded Engineer	Able to understand the concept of Embedded system, get the knowledge of programming	GOAL-4(quality Education)	

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SEMESTER- 3rd
Course: M. Tech VLSI
SUBJECT: Digital HDL Design and Verification

Subject Code: 6TMVD302 (C)
Theory Max. Marks: 50
Theory Min. Marks: 17

COURSE OBJECTIVE:

HDL programming is fundamental for VLSI design and hence this course is given.

- To gain knowledge on VHDL.
- To get an insight on Advanced VHDL.
- To understand the System C.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	VHDL- Basic Concepts Operators, Basic concepts, Entity and Architecture design, System task and functions, Value set, Data types, Operands, Operators, Entity and ports, Gate level Modeling, Dataflow Modeling, Behavioral Modeling, Test Bench- lab exercise.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – II	VHDL- Advanced Features Packages and Functions, Sub-Program, User Defined Attributes, Specifications and Configurations, Delay modeling- pin-to-pin delay & distributed delay modeling- Timingdelay analysis- FSM design and Synthesis-UART –lab exercise.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – III	System C – Introduction Introduction to System C- Design methodology – Data Types – Bit, Logic, Integer, Precision signed type & resolved types, user defined data type- Data operators – Logical, arithmetic, relational operators, vectors and ranges sequential statements – IF, LOOP, SWITCH statements- methods – structures.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – IV	Combinational & Synchronous Logic Design in System C SC module – File Structure, Reading and writing port signals. Miscellaneous logic – modeling basic combinational logic circuits (Multiplexer, Decoder, encoder, memory model, modeling an FSM- Moore's and Mealy FSM – Universal Shift Register.	Usage of ICT like PPT, Video Lectures, Black board.
Unit - V	System C – Advanced Features SC_THREAD process, dynamic sensitivity- constructors – arguments, Filter design - ports, interfaces and channels. Advanced Topics – shared data members, fixed point types– Module- simulation algorithm –Runtime Environment.	Usage of ICT like PPT, Video Lectures, Black board.

Reference Books:

- VHDL: Coding Styles and Methodologies Ben Cohen Kluwer Academic Publisher (1999), Reprint 2004
- A System C Primer J. Bhaskar Galaxy Publications, 2004
- VHDL: Modular Design and synthesis of cores and systems Z. Navabi McGraw Hill Publications, Reprint 2005

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Design Engineer, Verification Engineer	Able to get the knowledge of VHDL & System C	GOAL-4(quality Education)	

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