MARTHANDAM COLLEGE OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

VLSI & DSP LAB

Equipments Available in the Lab

Sl.No	Hardware	Specification	Quantity
1.	Desktops	Dell Desktop Motherboard 1GB RAM, LED Monitor Zebronics Keyboard and Optical Mouse	15 Nos
2.	Fixed DSP processor TMS 320C50		10
3.	Fixed/floating point DSP processor TMS 320C5416		05
4.	Function Generator		10
5.	CRO		10
6.	LAN Trainer		05
7.	UPS		01
8.	LAN Switch		02
9.	FPGA Trainer kit		15
10.	Xilinx Vertex 4 Boards		02
11.	Altera Cyclone II Boards		04
12.	Embedded trainer kits with ARM board		7
13.	Embedded trainer kits suitable for wireless communication		7
14.	Analog Discovery		10
15.	Digital storage		7

	Oscilloscope		
16.	Interface Board – ADC		2
17.	DAC		2
18.	Motor Control		2
Software			
1	Tanner Software		
2	MATLAB		

COURSES OFFERED

Sl.No	Odd Sem (Course code & Name)	Class	Even Sem (Course code & Name)	Class
1	EC3561 - VLSI Laboratory	III ECE	EC8652 Wireless Communication	III ECE
2	EC8711 Embedded Laboratory	IV ECE	EC3492 Digital Signal Processing	II ECE

EC3561 VLSI LABORATORY

COURSE OBJECTIVES:

● To learn Hardware Descriptive Language (Verilog/VHDL).

● To learn the fundamental principles of Digital System Design using HDL and FPGA.

● To learn the fundamental principles of VLSI circuit design in digital domain

● To learn the fundamental principles of VLSI circuit design in analog domain

● To provide hands on design experience with EDA platforms.

COURSE OUTCOMES:

On completion of the course, students will be able to:

- Write HDL code for basic as well as advanced digital integrated circuit
- Import the logic modules into FPGA Boards
- Synthesize Place and Route the digital Ips 96
- Design, Simulate and Extract the layouts of Digital & Analog IC Blocks using EDA tools Test and Verification of IC design

LIST OF EXPERIMENTS:

1. Design of basic combinational and sequential (Flip-flops) circuits using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA

2. Design an Adder ; Multiplier (Min 8 Bit) using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA

3. Design and implement Universal Shift Register using HDL. Simulate it using Xilinx/Altera Software 4. Design Memories using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA

5. Design Finite State Machine (Moore/Mealy) using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA

6. Design 3-bit synchronous up/down counter using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA

7. Design 4-bit Asynchronous up/down counter using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA

8. Design and simulate a CMOS Basic Gates & Flip-Flops. Generate Manual/Automatic Layout.

9. Design and simulate a 4-bit synchronous counter using a Flip-Flops. Generate Manual/Automatic Layout

10. Design and Simulate a CMOS Inverting Amplifier.

11. Design and Simulate Basic Common Source, Common Gate and Common Drain Amplifiers.

12. Design and simulate simple transistors differential amplifier.

EC8711 EMBEDDED LABORATORY

OBJECTIVES:

The student should be made to:

- Learn the working of ARM processor
- Understand the Building Blocks of Embedded Systems
- Learn the concept of memory map and memory interface
- Write programs to interface memory, I/Os with processor
- Study the interrupt performance

OUTCOMES:

At the end of the course, the student should be able to:

- Write programs in ARM for a specific Application

- Interface memory, A/D and D/A convertors with ARM system
- Analyze the performance of interrupt
- Write program for interfacing keyboard, display, motor and sensor.

Formulate a mini project using embedded system

LIST OF EXPERIMENTS:

1. Study of ARM evaluation system
2. Interfacing ADC and DAC.
3. Interfacing LED and PWM.
4. Interfacing real time clock and serial port.
5. Interfacing keyboard and LCD.
6. Interfacing EPROM and interrupt.
7. Mailbox.
8. Interrupt performance characteristics of ARM and FPGA.
9. Flashing of LEDS.
10. Interfacing stepper motor and temperature sensor.
11. Implementing ZigBee protocol with ARM.

EC3492 DIGITAL SIGNAL PROCESSING

OBJECTIVES:

● To learn discrete Fourier transform, properties of DFT and its application to linear filtering
● To understand the characteristics of digital filters, design digital IIR and FIR filters and apply these filters to filter undesirable signals in various frequency bands
● To understand the effects of finite precision representation on digital filters
● To understand the fundamental concepts of multi rate signal processing and its applications
● To introduce the concepts of adaptive filters and its application to communication engineering

OUTCOMES:

Upon Completion of the course, the students will be able to:

- Apply DFT for the analysis of digital signals and systems
- Design IIR and FIR filters
- Characterize the effects of finite precision representation on digital filters
- Design multirate filters
- Apply adaptive filters appropriately in communication systems

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LIST OF EXPERIMENTS

1. Generation of elementary Discrete-Time sequences

2. Linear and Circular convolutions

3. Auto correlation and Cross Correlation

4. Frequency Analysis using DFT

5. Design of FIR filters (LPF/HPF/BPF/BSF) and demonstrates the filtering operation

6. Design of Butterworth and Chebyshev IIR filters (LPF/HPF/BPF/BSF) and demonstrate the filtering operations

7. Study of architecture of Digital Signal Processor

8. Perform MAC operation using various addressing modes

9. Generation of various signals and random noise

10. Design and demonstration of FIR Filter for Low pass, High pass, Band pass and Band stop filtering

11. Design and demonstration of Butter worth and Chebyshev IIR Filters for Low pass, High pass, Band pass and Band stop filtering

12. Implement an Up-sampling and Down-sampling operation in DSP Processor

EC 3501 – WIRELESS COMMUNICATION LABORATORY

OBJECTIVES:

- To study and understand the concepts and design of a Cellular System.
- To Study and Understand Mobile Radio Propagation and Various Digital Modulation Techniques.
- To Understand the Concepts of Multiple Access Techniques and Wireless Networks

OUTCOMES:

- Understand The Concept and Design of a Cellular System.
- Understand Mobile Radio Propagation and Various Digital Modulation Techniques.
- Understand The Concepts of Multiple Access Techniques And Wireless Networks
- Characterize a wireless channel and evolve the system design specifications
- Design a cellular system based on resource availability and traffic demands.

LIST OF EXPERIMENTS

1. Modeling of wireless communication systems using Matlab (Two ray channel and Okumura –Hata model)
2. Modeling and simulation of Multipath fading channel

3. Design, analyze and test Wireless standards and evaluate the performance measurements such as BER, PER, BLER, throughput, capacity, ACLR, EVM for 4G and 5G using Matlab
4. Modulation: Spread Spectrum – DSSS Modulation & Demodulation
5. Wireless Channel equalization: Zero-Forcing Equalizer (ZFE),MMSE Equalizer(MMSEE),Adaptive Equalizer (ADE),Decision Feedback Equalizer (DFE)
6.Modeling and simulation of TDMA, FDMA and CDMA for wireless communication