# M.E. Embedded System Technologies
## I to IV Semesters (Full Time) Curriculum and Syllabus
### Semester I

<table>
<thead>
<tr>
<th>Sl.No</th>
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**TOTAL NUMBER OF CREDITS = 69**

## ELECTIVES FOR M.E. EMBEDDED SYSTEM TECHNOLOGIES

### ELECTIVE I

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<th>Sl. No</th>
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OBJECTIVES:

- To develop the ability to apply the concepts of Matrix theory and Linear programming in Electrical Engineering problems.
- To achieve an understanding of the basic concepts of one dimensional random variables and apply in electrical engineering problems.
- To familiarize the students in calculus of variations and solve problems using Fourier transforms associated with engineering applications.

UNIT I  MATRIX THEORY  (9+3)
The Cholesky decomposition - Generalized Eigen vectors, Canonical basis - QR factorization - Least squares method - Singular value decomposition.

UNIT II  CALCULUS OF VARIATIONS  (9+3)
Concept of variation and its properties – Euler’s equation – Functional dependant on first and higher order derivatives – Functionals dependant on functions of several independent variables – Variational problems with moving boundaries – problems with constraints - Direct methods: Ritz and Kantorovich methods.

UNIT III  ONE DIMENSIONAL RANDOM VARIABLES  (9+3)

UNIT IV  LINEAR PROGRAMMING  (9+3)
Formulation – Graphical solution – Simplex method – Two phase method - Transportation and Assignment Models

UNIT V  FOURIER SERIES  (9+3)

REFERENCES:

OBJECTIVES

- To expose the students to the fundamentals of sequential system design, modelling
- To teach the fundamentals of Asynchronous circuits, switching errors
- To study on Fault identification in digital switching circuits
- To introduce logics for design of Programmable Devices
- To comparatively study the classification of commercial family of Programmable Devices

UNIT I  SEQUENTIAL CIRCUIT DESIGN  9

UNIT II ASYNCHRONOUS SEQUENTIAL CIRCUIT DESIGN  9

UNIT III FAULT DIAGNOSIS AND TESTABILITY ALGORITHMS  9

UNIT IV SYNCHRONOUS DESIGN USING PROGRAMMABLE DEVICES  9
Programming Techniques -Re-Programmable Devices Architecture- Function blocks, I/Oblocks, Interconnects, Realize combinational, Arithmetic, Sequential Circuit with Programmable Array Logic; Architecture and application of Field Programmable Logic Sequence.

UNIT V ARCHITECTURES AND PROGRAMMING PROGRAMMABLE LOGIC DEVICES  9

TOTAL : 45 PERIODS

REFERENCES:
OBJECTIVES

- To expose the students to the fundamentals of microcontroller based system design.
- To teach I/O and RTOS role on microcontroller.
- To impart knowledge on PIC Microcontroller based system design.
- To introduce Microchip PIC 8 bit peripheral system Design
- To give case study experiences for microcontroller based applications.

UNIT I 8051 ARCHITECTURE


UNIT II 8051 PROGRAMMING


UNIT III PIC MICROCONTROLLER


UNIT IV PERIPHERAL OF PIC MICROCONTROLLER


UNIT V SYSTEM DESIGN – CASE STUDY

Interfacing LCD Display – Keypad Interfacing - Generation of Gate signals for converters and Inverters - Motor Control – Controlling DC/ AC appliances – Measurement of frequency - Stand alone Data Acquisition System.

TOTAL : 45 PERIODS

REFERENCES:
OBJECTIVES

- To expose the students to the fundamentals of Real Time systems
- To teach the fundamentals of Scheduling and features of programming languages
- To study the data management system for real time
- To introduce the fundamentals of real time communication
- To teach the different algorithms and techniques used for real time systems

UNIT I INTRODUCTION 9

UNIT II PROGRAMMING LANGUAGES AND TOOLS 9

UNIT III REAL TIME DATABASES 9
Real time Databases – Basic Definition, Real time Vs General Purpose Databases, Main Memory Databases, Transaction priorities, Transaction Aborts, Concurrency control issues, Disk Scheduling Algorithms, Two – phase Approach to improve Predictability – Maintaining Serialization Consistency – Databases for Hard Real Time Systems.

UNIT IV COMMUNICATION 9

UNIT V EVALUATION TECHNIQUES 9

TOTAL : 45 PERIODS

REFERENCES

5. S.T. Allworth and R.N.Zobel, “Introduction to real time software design”, Macmillan,
ET7104 DESIGN OF EMBEDDED SYSTEMS

OBJECTIVES

- To provide a clear understanding on the basic concepts, Building Blocks for Embedded System
- To teach the fundamentals of System design with Partitioning
- To introduce on Embedded Process development Environment
- To study on Basic tool features for target configuration
- To introduce different EDLC Phases & Testing of embedded system

UNIT I EMBEDDED DESIGN WITH MICROCONTROLLERS


UNIT II PARTITIONING DECISION


UNIT III FUNCTIONALITIES FOR SYSTEM DESIGN

Timers, Watch dog timers – RAM, Flash Memory basic toolset – Integration of Hardware & Firmware- InSystem Programming, InApplication Programming, IDE- Target Configuration- Host based debugging – Remote debugging – ROM emulators – Logic analyser

UNIT IV IN CIRCUIT EMULATORS


UNIT V EMBEDDED DESIGN LIFE CYCLE & TESTING


TOTAL : 45 PERIODS
REFERENCES

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<th>Requirement</th>
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<td>Programming with 8 bit Microcontrollers Both Assembly and C programming</td>
<td>8 bit Microcontrollers with peripherals; Board Support Software Tools</td>
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<tr>
<td>2</td>
<td>Programming with 8 bit Microcontrollers I/O Programming/ Timers/ Interrupts/ Serial port programming/PWM Generation/ Motor Control/ADC/DAC/ LCD/ RTC Interfacing</td>
<td>8 bit Microcontrollers with peripherals; Board Support Software Tools, peripherals with interface DSO(2); Multimeters(6); 3 Types of Sensors(3 each); DC &amp; AC Motors 2 each; interface supports(3 each)</td>
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<td>Programming with 8 bit PIC/AVR Microcontrollers Both Assembly and C programming</td>
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<td>PIC/AVR Microcontrollers with peripherals; Board Support Software Tools, peripherals with interface DSO(2); Multimeters(6); 3 Types of Sensors(3 each); DC &amp; AC Motors 2 each; interface supports(3 each)</td>
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<td>16 bit Microcontrollers with peripherals; Board Support Software Tools with interface DSO(2); Multimeters(6); 3 Types of Sensors(3 each); DC &amp; AC Motors 2 each; interface supports(3 each)</td>
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<tr>
<td>7</td>
<td>Design with CAD tools Design and Implementation of Combinational, Sequential Circuits in CAD simulators</td>
<td>Simulation Tools as SPICE/others</td>
<td>Multiple user</td>
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<tr>
<td>8</td>
<td>Study on incircuit Emulators, crosscompilers, debuggers</td>
<td>Microcontrollers with peripherals; IDE, Board Support Software Tools /Uc/OS-II/C Compiler/others</td>
<td>Multiple user</td>
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<td>9</td>
<td>Simulation &amp; Programming of sensor interface &amp; measurement with using programming environments (MATLAB/LabVIEW/Simulation Tools)</td>
<td>Simulation Tools as MATLAB/ LABVIEW /others</td>
<td>Multiple user</td>
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<td>Programming of TCP/IP protocol stack</td>
<td>Simulation &amp; Experimenting set with IAR C/C++ Compiler, Assembler, peripherals; Board Support Software Tools</td>
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**TOTAL: 45 PERIODS**

**ET7201 VLSI ARCHITECTURE AND DESIGN METHODOLOGIES**  
**LT P C**  
3 0 0 3

**OBJECTIVES**
- To give an insight to the students about the significance of CMOS technology and fabrication process.
- To teach the importance and architectural features of programmable logic devices.
- To introduce the ASIC construction and design algorithms.
- To teach the basic analog VLSI design techniques.
- To study the Logic synthesis and simulation of digital system with Verilog HDL.

**UNIT I CMOS DESIGN**
Overview of digital VLSI design Methodologies- Logic design with CMOS-transmission gate circuits-Clocked CMOS-dynamic CMOS circuits, Bi-CMOS circuits- Layout diagram, Stick diagram-IC fabrications – Trends in IC technology.

**UNIT II PROGRAMABLE LOGIC DEVICES**

**UNIT III BASIC CONSTRUCTION, FLOOR PLANNING, PLACEMENT AND ROUTING**

**UNIT IV ANALOG VLSI DESIGN**

**UNIT V LOGIC SYNTHESIS AND SIMULATION**
Overview of digital design with Verilog HDL, hierarchical modelling concepts, modules and port definitions, gate level modelling, data flow modelling, behavioural modelling, task & functions, Verilog and logic synthesis-simulation-Design examples, Ripple carry Adders, Carry Look ahead adders, Multiplier, ALU, Shift Registers, Multiplexer, Comparator, Test Bench.

**TOTAL 45 PERIODS**
REFERENCES:

ET7202 EMBEDDED NETWORKING L T P C 3 1 0 4

OBJECTIVES
To impart knowledge on

- Serial and parallel communication protocols
- Application Development using USB and CAN bus for PIC microcontrollers
- Application development using Embedded Ethernet for Rabbit processors.
- Wireless sensor network communication protocols.

UNIT I EMBEDDED COMMUNICATION PROTOCOLS 8

UNIT II USB AND CAN BUS 10

UNIT III ETHERNET BASICS 9

UNIT IV EMBEDDED ETHERNET 9
UNIT V  WIRELESS EMBEDDED NETWORKING  

L = 45  T = 15  TOTAL = 60 PERIODS

REFERENCES
2. Jan Axelson, ‘Parallel Port Complete’, Penram publications
4. Jan Axelson ‘Embedded Ethernet and Internet Complete’, Penram publications

ET7203  WIRELESS AND MOBILE COMMUNICATION  L T P C
3 0 0 3

OBJECTIVES
• To expose the students to the fundamentals of wireless communication technologies.
• To teach the fundamentals of wireless mobile network protocols
• To study on wireless network topologies
• To introduce network routing protocols
• To study the basis for classification of commercial family of wireless communication technologies

UNIT I  INTRODUCTION  9

UNIT II  MOBILE NETWORKS  9

UNIT III  WIRELESS NETWORKS  9

UNIT IV  ROUTING  9
Mobile IP – DHCP – AdHoc Networks – Proactive and Reactive Routing Protocols – Multicast Routing

UNIT V  TRANSPORT AND APPLICATION LAYERS  9
REFERENCES

ET7204 SOFTWARE FOR EMBEDDED SYSTEMS L T P C
3 0 0 3

OBJECTIVES
- To expose the students to the fundamentals of embedded Programming.
- To Introduce the GNU C Programming Tool Chain in Linux.
- To study the basic concepts of embedded C and Embedded OS
- To introduce time driven architecture, Serial Interface with a case study.
- To introduce the concept of embedded Java for Web Enabling of systems.

UNIT I EMBEDDED PROGRAMMING 9

UNIT II C PROGRAMMING TOOLCHAIN IN LINUX 9
C preprocessor - Stages of Compilation - Introduction to GCC - Debugging with GDB - The Make utility - GNU Configure and Build System - GNU Binary utilities - Profiling - using gprof - Memory Leak Detection with valgrind - Introduction to GNU C Library

UNIT III EMBEDDED C AND EMBEDDED OS 9
Adding Structure to ‘C’ Code: Object oriented programming with C, Header files for Project and Port, Examples. Meeting Real-time constraints: Creating hardware delays - Need for timeout mechanism - Creating loop timeouts - Creating hardware timeouts. Creating embedded operating system: Basis of a simple embedded OS, Introduction to sEOS, Using Timer 0 and Timer 1, Portability issue, Alternative system architecture, Important design considerations when using sEOS.
UNIT IV   TIME-DRIVEN MULTI-STATE ARCHITECTURE AND HARDWARE  


UNIT V   EMBEDDED JAVA  


TOTAL : 45 PERIODS

REFERENCES


ET7211  EMBEDDED SYSTEM LABORATORY  II  L T P C  

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<td>1</td>
<td>Programming with ARM Processors Both Assembly and C programming, I/O Programming/ Timers/ Interrupts, /ADC/ DAC/ LCD /RTC Interfacing/ Sensor Interfacing/i/o device control</td>
<td>ARM family Processors With IDE, Board Support Packages &amp; Peripherals DSO(2);Multimeters(6); 3 Types of Sensors(3 each);DC &amp; AC Motors 2 each);interface supports(3 each)</td>
<td>Multiple user</td>
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<tr>
<td>2</td>
<td>Programming with Fixed Point &amp; Floating Point DSP Processors Both Assembly /C programming/ CCS Compilers- Programming with DSP processors for Correlation, Convolution, Arithmetic adder, Multiplier, Design of Filters - FIR based , IIR based</td>
<td>Fixed Point &amp; Floating Point DSP Processors With IDE, Board Support Packages &amp; Peripherals</td>
<td>2 set each</td>
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<td>Design using Xilinx/Altera CPLD</td>
<td>Xilinx/Altera CPLD Processor</td>
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<td>1</td>
<td>Design using Xilinx/Altera FPGA</td>
<td>Xilinx/Altera FPGA Processor</td>
<td>Multiple user</td>
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<td>Design and Implementation of</td>
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<td>Design using Xilinx/Altera CPLD</td>
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<td>Design and Implementation of</td>
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<td>5</td>
<td>Simple Combinational/Sequential</td>
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<td>6</td>
<td>Circuits</td>
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<td>Circuits</td>
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<td>8</td>
<td>Interfacing: Motor Control</td>
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<td>9</td>
<td>Interface/ Sensor</td>
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<td>10</td>
<td>Processor</td>
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<td>11</td>
<td>Motor Control/ADC/DAC/LCD / RTC</td>
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<td>12</td>
<td>Interfacing/ Sensor</td>
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<td>13</td>
<td>Interfacing</td>
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<td>14</td>
<td>ARM Processor Microcontroller</td>
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<td>15</td>
<td>Study of one type of Real Time</td>
<td>ARM Processor/Microcontroller</td>
<td>Multiple user</td>
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<td>16</td>
<td>Operating Systems (RTOS) with</td>
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<td>17</td>
<td>Network Simulators</td>
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<td>18</td>
<td>Communication Topology of</td>
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<td>19</td>
<td>Network using NS2/simulators</td>
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<td>20</td>
<td>Study on Embedded wireless</td>
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<td>21</td>
<td>Network Topology</td>
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<td>22</td>
<td>Study on Embedded wireless</td>
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<td>23</td>
<td>Study on Embedded wireless</td>
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<td>24</td>
<td>Network Topology</td>
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<td>25</td>
<td>Simulation of digital controllers</td>
<td>(MATLAB/LabVIEW/Simulators)</td>
<td>Multiple user</td>
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<td>26</td>
<td>using programming environments</td>
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<td>27</td>
<td>Programming using programming</td>
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<td>Programming using programming</td>
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<td>Programming using programming</td>
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<td>30</td>
<td>TOTAL= 45 PERIODS</td>
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</tbody>
</table>

REFERENCES:

4. Rashid,” Introduction to PSPICE using Orcad for Circuits And Electronics”
5. Jan Axelson ‘Embedded Ethernet and Internet Complete’, Penram publications
OBJECTIVES

- To discuss to the students on the fundamentals building blocks of a digital instrument
- To teach the digital data communication techniques
- To study on bus communication standards and working principles
- To teach Graphical programming using GUI for instrument building
- The case studies to be developed/ discussed

UNIT I DATA ACQUISITION SYSTEMS
Overview of A/D converter, types and characteristics – Sampling, Errors. Objective – Building blocks of Automation systems – Counters – Modes of operation- Frequency, Period, Time interval measurements, Prescaler, Heterodyne converter for frequency measurement, Single and Multi channel Data Acquisition systems.

UNIT II INTERFACING AND DATA TRANSMISSION

UNIT III INSTRUMENTATION BUS

UNIT IV VIRTUAL INSTRUMENTATION

UNIT V CASE STUDIES
PC based DAS, Data loggers, PC based industrial process measurements like flow, temperature, pressure and level development system, CRT interface and controller with monochrome and colour video display.

TOTAL : 45 PERIODS
REFERENCES:

ET7002  REAL TIME OPERATING SYSTEMS  L T P C
                                                3 0 0 3

OBJECTIVES
- To expose the students to the fundamentals of interaction of OS with a computer and User computation.
- To teach the fundamental concepts of how process are created and controlled with OS.
- To study on programming logic of modeling Process based on range of OS features.
- To compare types and Functionalties in commercial OS.
- To discuss the application development using RTOS.

UNIT I   REVIEW OF OPERATING SYSTEMS  15

UNIT II  OVERVIEW OF RTOS  9

UNIT III  REAL TIME MODELS AND LANGUAGES  6

UNIT IV  REAL TIME KERNEL  6
Principles – Design issues – Polled Loop Systems – RTOS Porting to a Target – Comparison and Basic study of various RTOS like – VX works – Linux supportive RTOS – C Executive.
UNIT V  RTOS APPLICATION DOMAINS


TOTAL : 45 PERIODS

REFERENCES:

ET7016 PARALLEL PROCESSING ARCHITECTURE

OBJECTIVES
- To expose the students to the fundamentals of interaction of OS with a computer and User computation.
- To teach the fundamental Parallel Processing.
- To study on networking for memory
- To compare types and Functionalities in commercial OS
- To discuss the parallel models development using software

UNIT I THEORY OF PARALLELISM
Parallel Computer models – the state of computing, Multiprocessors and Multicomputers and Multivectors and SIMD computers, PRAM and VLSI models, Architectural development tracks, Program and network properties – Conditions of parallelism.

UNIT II PARTITIONING AND SCHEDULING
Program partitioning and scheduling, Program flow mechanisms, System interconnect architectures, Principles of scalable performance – performance matrices and measures, Parallel processing applications, speedup performance laws, scalability analysis and approaches.

UNIT III HARDWARE TECHNOLOGIES
Processor and memory hierarchy advanced processor technology, superscalar and vector processors, memory hierarchy technology, virtual memory technology, bus cache and shared
memory – backplane bus systems, cache memory organizations, shared memory organizations, sequential and weak consistency models.

UNIT IV PIPELINING AND SUPERSCALAR TECHNOLOGIES
9
Parallel and scalable architectures, Multiprocessor and Multicomputers, Multivector and SIMD computers, Scalable, Multithreaded and data flow architectures.

UNIT V SOFTWARE AND PARALLEL PROCESSING
9
Parallel models, Languages and compilers, Parallel program development and environments, UNIX, MACH and OSF/1 for parallel computers.

TOTAL : 45 PERIODS

REFERENCES:

OBJECTIVES
- To expose the students to the fundamentals of Embedded System Blocks
- To teach the fundamental RTOS.
- To study on interfacing for processor communication
- To compare types and Functionalities in commercial software tools
- To discuss the Applications development using interfacing

UNIT I EMBEDDED SYSTEM ORGANIZATION 9
Embedded computing – characteristics of embedded computing applications – embedded system design challenges; Build process of Realtime Embedded system – Selection of processor; Memory; I/O devices-Rs-485, MODEM, Bus Communication system using I²C, CAN, USB buses, 8 bit –ISA, EISA bus;

UNIT II REAL-TIME OPERATING SYSTEM 9
Introduction to RTOS; RTOS- Inter Process communication, Interrupt driven Input and Output - Nonmaskable interrupt, Software interrupt; Thread – Single, Multithread concept; Multitasking Semaphores.

UNIT III INTERFACE WITH COMMUNICATION PROTOCOL 9
Design methodologies and tools – design flows – designing hardware and software Interface . – system integration; SPI, High speed data acquisition and interface-SPI read/write protocol, RTC interfacing and programming;

UNIT IV DESIGN OF SOFTWARE FOR EMBEDDED CONTROL 9
Software abstraction using Mealy-Moore FSM controller, Layered software development, Basic concepts of developing device driver – SCI – Software - interfacing & porting using standard C & C++ ; Functional and performance Debugging with benchmarking Real-time system software – Survey on basics of contemporary RTOS – VXWorks, UC/OS-II

UNIT V CASE STUDIES WITH EMBEDDED CONTROLLER 9
Programmable interface with A/D & D/A interface; Digital voltmeter, control- Robot system; - PWM motor speed controller, serial communication interface.

TOTAL : 45 PERIODS

REFERENCES:

ET7004 PROGRAMMING WITH VHDL L T P C 3 0 0 3

OBJECTIVES

- To give an insight to the students about the significance of VHDL Programming
- To teach the importance and architectural modelling of programmable logic devices.
- To introduce the construction and design programming
- To teach the basic VLSI design configurations
- To study the Logic synthesis and simulation of digital system with PLD.

UNIT I VHDL FUNDAMENTALS 9
Fundamental concepts- Modeling digital system-Domain and levels of modeling-modeling languages-VHDL modeling concepts-Scalar Data types and operations- constants and Variable-Scalar Types- Type Classification-Attributes and scalar types-expression and operators-Sequential statements.

UNIT II DATA TYPES AND BASIC MODELING CONSTRUCTS 9
Arrays- unconstrained array types-array operations and referencing- records - Access Types-Abstract Date types- -basic modeling constructs-entity declarations-Architecture bodies-behavioral description-structural descriptions- design Processing, case study: A pipelined Multiplier accumulator.

UNIT III SUBPROGRAMS, PACKAGES AND FILES 9

UNIT IV SIGNALS, COMPONENTS, CONFIGURATIONS. 9
UNIT V  DESIGN WITH PROGRAMMABLE LOGIC DEVICES  9
Realization of -Micro controller CPU.- Memories- I/O devices-MAC-Design,synthesis,simulation and testing.

REFERENCES


ET7005  ADHOC NETWORKS  L T P C  3 0 0 3

OBJECTIVES
• To expose the students to the fundamentals of wireless communication technologies.
• To teach the fundamentals of wireless network routing protocols
• To study on wireless issues in network layers topologies
• To introduce energy management in network routing protocols
• To study the basis of performance metrics for N/W communication technologies

UNIT I  WIRELESS LAN, PAN, WAN AND MAN  9

UNIT II  MAC, ROUTING AND MULTICAST ROUTING PROTOCOLS  9
UNIT III TRANSPORT LAYER AND SECURITY PROTOCOLS


Quality of Service: Issues and challenges in providing QoS, Classification of QoS solutions, MAC layer solutions, Network layer solutions, QoS frameworks.

UNIT IV ENERGY MANAGEMENT

Need, classification of battery management schemes, Transmission power management schemes, System power management schemes.

Wireless Sensor Networks: Architecture, Data dissemination, Date gathering, MAC protocols, location discovery, Quality of a sensor network.

UNIT V PERFORMANCE ANALYSIS

ABR beaconing, Performance parameters, Route-discovery time, End-to-end delay performance, Communication throughput performance, Packet loss performance, Route reconfiguration/repair time, TCP/IP based applications.

TOTAL : 45 PERIODS

REFERENCES

1. C. Siva Ram Murthy and B.S. Manoj, AdHoc Wireless Networks: Architectures and protocols, Prentice Hall PTR, 2004

ET7006 ADVANCED DIGITAL SIGNAL PROCESSING

OBJECTIVES

- To expose the students to the fundamentals of digital signal processing in frequency domain& its application
- To teach the fundamentals of digital signal processing in time-frequency domain& its application
- To compare Architectures & features of Programmable DSprocessors
- To discuss on Application development with commercial family of DS Processors
- To design & develop logical functions of DSProcessors with Re-Programmable logics &Devices
UNIT I  INTRODUCTION TO DIGITAL SIGNAL PROCESSING

UNIT II  WAVELET TRANSFORM
Introduction to continuous wavelet transform- discrete wavelet transform -orthogonal wavelet decomposition- Multiresolution Analysis-Wavelet function-DWT,bases,orthogonal Basis-Scaling function, Wavelet coefficients- ortho normal wavelets and their relationship to filter banks- Digital filtering interpolation (i) Decomposition filters, (ii) reconstruction, the signal- Example MRA- Haar & Daubechies wavelet.

UNIT III  ARCHITECTURES OF COMMERCIAL DIGITAL SIGNAL PROCESSORS
Introduction, catogorisation of DSP Processors, Fixed Point (Blackfin),Floating Point (SHARC),TI TMS 320c6xxx & OMAP processors TMS320C54X & 54xx on Basic Architecture – comparison : of functional variations of Computational building blocks, MAC, Bus Architecture and memory, Data Addressing, Parallelism and pipelining, Parallel I/O interface,Memory Interface, Interrupt, DMA (one example Architecture in each of these case studies).

UNIT IV  INTERFACING I/O PERIPHERALS FOR DSP BASED APPLICATIONS

UNIT V  VLSI IMPLEMENTATION
Low power Design-need for Low power VLSI chips-Basics of DSP system architecture design using VHDL programming, Mapping of DSP algorithm onto hardware, Realisation of MAC & Filter structure.

REFERENCES:

TOTAL : 45 PERIODS
OBJECTIVES

- To expose the concepts of feed forward neural networks.
- To provide adequate knowledge about feed back neural networks.
- To teach about the concept of fuzziness involved in various systems.
- To expose the ideas about genetic algorithm
- To provide adequate knowledge about of FLC and NN toolbox

UNIT I INTRODUCTION AND ARTIFICIAL NEURAL NETWORKS


UNIT II ARTIFICIAL NEURAL NETWORKS


UNIT III FUZZY LOGIC SYSTEM

Introduction to crisp sets and fuzzy sets- basic fuzzy set operation and approximate reasoning. Introduction to fuzzy logic modeling and control- Fuzzification- inferencingand defuzzification- Fuzzy knowledge and rule bases-Fuzzy modeling and control schemes for nonlinear systems. Self organizing fuzzy logic control- Fuzzy logic control for nonlinear time delay system.

UNIT IV GENETIC ALGORITHM

Basic concept of Genetic algorithm and detail algorithmic steps-adjustment of free Parameters- Solution of typical control problems using genetic algorithm- Concept on some other search techniques like tabu search and ant colony search techniques for solving optimization problems.
UNIT V APPLICATIONS


TOTAL : 45 PERIODS

REFERENCES

1. Laurene V. Fausett, Fundamentals of Neural Networks: Architectures, Algorithms And Applications, Pearson Education,
2. Timothy J. Ross, “Fuzzy Logic with Engineering Applications” Wiley India.

ET7007 RISC PROCESSOR ARCHITECTURE AND PROGRAMMING L T P C

TOTAL : 45 PERIODS

OBJECTIVES

- To teach the architecture of 8 bit RISC processor
- To teach the architecture and programming of 16 bit RISC processor
- To teach the implementation of DSP in ARM processor
- To discuss on memory management in RISC processor
- To teach the application development with ARM processor

UNIT I AVR MICROCONTROLLER ARCHITECTURE


UNIT II ARM ARCHITECTURE AND PROGRAMMING


UNIT III ARM APPLICATION DEVELOPMENT

UNIT IV  MEMORY PROTECTION AND MANAGEMENT
Protected Regions- Initializing MPU, Cache and Write Buffer-MPU to MMU-Virtual Memory-Page Tables-TLB-Domain and Memory Access Permission-Fast Context Switch Extension.

UNIT V  DESIGN WITH ARM MICROCONTROLLERS

TOTAL : 45 PERIODS

REFERENCES
1. Steve Furber, ‘ARM system on chip architecture’, Addison Wesley
3. Trevor Martin, ‘The Insider’s Guide To The Philips ARM7-Based Microcontrollers, An Engineer’s Introduction To The LPC2100 Series’ Hitex (UK) Ltd.,
7. LPC213x User Manual

OBJECTIVES
- To teach the Fundamentals on design attributes of functional units of a Processor
- To discuss on Hardware software partitioning in system design
- To teach intra & Inter processor Communications
- To discuss strategies for processor Communications
- To discuss on Co-Designs

UNIT I  INTRODUCTION TO EMBEDDED HARDWARE AND SOFTWARE

UNIT II  SYSTEM MODELLING WITH HARDWARE/SOFTWARE PARTITIONING
UNIT III HARDWARE/SOFTWARE CO-SYNTHESIS
The Co-Synthesis Problem, State-Transition Graph, Refinement and Controller Generation, Distributed System Co-Synthesis.

UNIT IV MEMORY AND INTERFACING

UNIT V CONCURRENT PROCESS MODELS AND HARDWARE SOFTWARE CO-DESIGN

REFERENCES

TOTAL : 45 PERIODS
OBJECTIVES

- To expose the students to the fundamentals of wireless sensor technology
- To teach the infrastructure of WSN processor and its functions
- To study on challenges in Network communication
- To discuss on interconnectivity of networks
- To study the classification of commercial family of wireless technology

UNIT I  OVERVIEW OF WIRELESS SENSOR NETWORKS  12
Challenges for Wireless Sensor Networks- Characteristic requirements for WSN - Challenges for WSNs – WSN vs Adhoc Networks - Sensor node architecture – Commercially available sensor nodes –Imote, IRIS, Mica Mote, TelosB,-Physical layer and transceiver design considerations in WSNs, introduction to fundamentals of MAC protocols - Low duty cycle protocols and wakeup concepts - Contention-based protocols - Schedule-based protocols -the IEEE 802.15.4 MAC protocol- Energy usage profile, Choice of modulation scheme, Dynamic modulation scaling, Antenna considerations-Applications of sensor networks

UNIT II  ISSUES IN PERVERSIVE SENSOR NETWORK  9

UNIT III  PERVERSIVE NETWORKING & COMPUTING  12

UNIT IV  PERVERSIVE DEVICES  6
Introduction with Case study of - PDA - Mobile Phone:Elements – Mobile Information Architecture - Mobile Phone Design - Android Overview – The Stack – Android User Interface – Preferences, the File System, the Options Menu and Intents.

UNIT V  EMERGING WIRELESS TECHNOLOGIES  6

TOTAL : 45 PERIODS
REFERENCES
2. Mullet,"Introduction to wireless telecommunications systems and networks", cengage learning, 2010 (unit 5)

ET7010 CRYPTOGRAPHY AND NETWORK SECURITY L T P C 3 0 0 3

Pre-requisites: Basics of Signal Processing, Mathematics of Transforms, microcontroller

OBJECTIVES
• To expose the students to the fundamentals of data security.
• To teach the fundamentals of mathematical aspects in creating Encryption keys
• To teach the fundamentals of Security in data communication.
• To teach the fundamentals of Secured system operation.
• To teach the fundamentals of Security in wireless communication.

UNIT I SYMMETRIC CIPHERS 9

UNIT II PUBLIC-KEY ENCRYPTION AND HASH FUNCTIONS 9

UNIT III NETWORK SECURITY PRACTICE 9
Authentication Applications – Kerberos – X.509 Authentication Service – Electronic mail

UNIT IV SYSTEM SECURITY 9

UNIT V WIRELESS SECURITY 9

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES

ET7011 SMART METER AND SMART GRID COMMUNICATION L T P C
3 0 0 3

Pre-requisites: Basics in Instrumentation, Power system and communication

OBJECTIVES
- To teach the fundamentals of automated meters and Grids.
- To teach on functional components of Smart meters
- To discuss on need of smart grid for power systems
- To teach the significance of microgrid and its needs
- To teach the communication and protocols for power system

UNIT I INTRODUCTION 9
Introduction to Smart grid and metering technology- Smart energy management technical architecture-Functions of Smart Grid and smart meters, Opportunities and challenges-Difference between conventional and smart grid-meters, Concept of Resilient and Self Healing Grid, recent developments and International policies in Smart Grid. IEC 61850 protocol standards.

UNIT II SMART METERS 9
Smart metering-Smart Meters types- hardware architecture- software architecture-requirements- communication protocols- Real Time Prizing, Smart Appliances, Automatic Meter Reading- MEMS, Smart Sensors- Smart actuators- Advanced metering infrastructure- spectrum analyzer.
UNIT III  SMART GRID AND APPLICATIONS  9

UNIT IV  MICROGRIDS  9
Concept of microgrid, need and applications of microgrid, formation of microgrid, Issues of interconnection, protection and control of microgrid. Plastic and Organic solar cells, Thin film solar cells, Variable speed wind generators, fuelcells, microturbines, Captive power plants, Integration of renewable energy sources.

UNIT V  INFORMATION AND COMMUNICATION TECHNOLOGY FOR SMART GRID AND METERS  9

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:
ET7012 COMPUTER IN NETWORKING AND DIGITAL CONTROL

Pre-requisites: Digital Circuits, Computer Technology, Basic in Measurement & Instrumentation

OBJECTIVES
- To discuss on the fundamentals of Network Layers for Data Communications
- To teach the digital data communication techniques
- To teach Graphical programming using GUI for instrument building
- To study on internet based communication standards and working principles
- The case studies to be developed/discussed in Virtual Environment Tools

UNIT I NETWORK FUNDAMENTALS
Data communication networking – Data transmission concepts – Communication networking - Overview of OSI- TCP/IP layers – IP addressing - DNS – Packet Switching – Routing – Fundamental concepts in SMTP, POP, FTP, Telnet, HTML, HTTP, URL, SNMP, ICMP.

UNIT II DATA COMMUNICATION
Sensor data acquisition, Sampling, Quantization, Filtering, Data Storage, Analysis using compression techniques, Data encoding – Data link control – Framing, Flow and Error control, Point to point protocol, Routers, Switches, Bridges – MODEMs, Network layer – Congestion control, Transport layer- Congestion control, Connection establishment.

UNIT III VIRTUAL INSTRUMENTATION

UNIT IV MEASUREMENT AND CONTROL THROUGH INTERNET
Web enabled measurement and control-data acquisition for Monitoring of plant parameters through Internet – Calibration of measuring instruments through Internet, Web based control – Tuning of controllers through Internet

UNIT V VI BASED MEASUREMENT AND CONTROL
Simulation of signal analysis & controller logic modules for Virtual Instrument control – Case study of systems using VI for data acquisition, Signal analysis, controller design, Drives control.

TOTAL: 45 PERIODS

REFERENCES:
ET7013 DISTRIBUTED EMBEDDED COMPUTING  L T P C  3 0 0 3

Pre-requisites: Basics in Programming, Embedded System & operating systems

OBJECTIVES
- To expose the students to the fundamentals of Network communication technologies.
- To teach the fundamentals of Internet
- To study on Java based Networking
- To introduce network routing Agents
- To study the basis for network on-chip technologies

UNIT I THE HARDWARE INFRASTRUCTURE

UNIT II INTERNET CONCEPTS
Capabilities and limitations of the internet – Interfacing Internet server applications to corporate databases HTML and XML Web page design and the use of active components.

UNIT III DISTRIBUTED COMPUTING USING JAVA

UNIT IV EMBEDDED AGENT

UNIT V EMBEDDED COMPUTING ARCHITECTURE

TOTAL : 45 PERIODS

REFERENCES:


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CL7004 ROBOTICS AND CONTROL L T P C

3 0 0 3

OBJECTIVES

- To introduce robot terminologies and robotic sensors
- To educate direct and inverse kinematic relations
- To educate on formulation of manipulator Jacobians and introduce path planning techniques
- To educate on robot dynamics
- To introduce robot control techniques

UNIT I INTRODUCTION AND TERMINOLOGIES:

Definition-Classification-History- Robots components-Degrees of freedom-Robot joints-coordinates- Reference frames-workspace-Robot languages-actuators-sensors- Position, velocity and acceleration sensors-Torque sensors-tactile and touch sensors-proximity and range sensors- vision system-social issues

UNIT II KINEMATICS

Mechanism-matrix representation-homogenous transformation-DH representation-Inverse kinematics-solution and programming-degeneracy and dexterity

UNIT III DIFFERENTIAL MOTION AND PATH PLANNING

Jacobian-differential motion of frames-Interpretation-calculation of Jacobian-Inverse Jacobian- Robot Path planning

UNIT IV DYNAMIC MODELLING

Lagrangian mechanics- Two-DOF manipulator- Lagrange-Euler formulation – Newton-Euler formulation – Inverse dynamics

UNIT V ROBOT CONTROL SYSTEM

Linear control schemes- joint actuators- decentralized PID control- computed torque control – force control- hybrid position force control- Impedance/ Torque control.

TOTAL : 45 PERIODS

REFERENCES

3. Fu, Gonzalez and Lee Mcgrahill ,"Robotics ", international
OBJECTIVES
- To teach the students properties of materials, microstructure and fabrication methods.
- To teach the design and modeling of Electrostatic sensors and actuators.
- To teach the characterizing thermal sensors and actuators through design and modeling.
- To teach the fundamentals of piezoelectric sensors and actuators.
- To give exposure to different MEMS and NEMS devices.

UNIT I MEMS: MICRO-FABRICATION, MATERIALS AND ELECTRO-MECHANICAL CONCEPTS
Overview of micro fabrication – Silicon and other material based fabrication processes – Concepts: Conductivity of semiconductors-Crystal planes and orientation-stress and strain-flexural beam bending analysis-torsional deflections-Intrinsic stress- resonant frequency and quality factor.

UNIT II ELECTROSTATIC SENSORS AND ACTUATION
Principle, material, design and fabrication of parallel plate capacitors as electrostatic sensors and actuators-Applications

UNIT III THERMAL SENSING AND ACTUATION
Principle, material, design and fabrication of thermal couples, thermal bimorph sensors, thermal resistor sensors-Applications.

UNIT IV PIEZOELECTRIC SENSING AND ACTUATION
Piezoelectric effect-cantilever piezo electric actuator model-properties of piezoelectric materials-Applications.

UNIT V CASE STUDIES
Piezo resistive sensors, Magnetic actuation, Micro fluidics applications, Medical applications, Optical MEMS:-NEMS Devices

TOTAL : 45 PERIODS

REFERENCES
ET7015 DIGITAL IMAGE PROCESSING AND APPLICATIONS

Pre-requisites: Signal Processing, Programming Techniques

OBJECTIVES
- To teach the students on fundamentals of image analysis.
- To teach the methods to improve image qualities.
- To teach the characterizing parameters for improve image qualities.
- To teach the fundamentals of image size reduction.
- To give exposure to different processing applications.

UNIT I FUNDAMENTALS OF IMAGE PROCESSING

UNIT II IMAGE ENHANCEMENT

UNIT III IMAGE SEGMENTATION AND FEATURE ANALYSIS

UNIT IV MULTI RESOLUTION ANALYSIS AND COMPRESSIONS

UNIT V APPLICATION OF IMAGE PROCESSING

TOTAL : 45 PERIODS

REFERENCES: