NATIONAL ENGINEERING COLLEGE

(An Autonomous Institution Affiliated to Anna University, Chennai)

K.R.NAGAR, KOVILPATTI – 628 503

REGULATIONS - 2011

DEPARTMENT OF

ELECTRONICS AND COMMUNICATION ENGINEERING

CURRICULUM AND SYLLABI OF

M.E. – EMBEDDED SYSTEMS TECHNOLOGIES

NATIONAL ENGINEERING COLLEGE, K.R.NAGAR, KOVILPATTI

(An Autonomous Institution Affiliated to Anna University Chennai)

M.E. (EMBEDDED SYSTEMS TECHNOLOGIES)

CURRICULUM AND SYLLABUS (FULL TIME)

SEMESTER I

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1	MMA102	Applied Mathematics for Electrical Engineers (Common to M.E EST, M.E HVE and M.E C&I)	3	1	0	4
2	MES101	Real Time Systems	3	0	0	3
3	MES102	Mixed Signal Processor	3	0	0	3
4	MES103	Advanced Computer Architecture	3	0	0	3
5	MES104	Modern Digital System Design	3	0	0	3
6	MES002	**Elective – I** Design of Embedded Control System	3	0	0	3
PRACTICAL						
7	MES131	Embedded System Laboratory	0	0	4	2
					Total Credits	**21**

SEMESTER II

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1	MES201	Low Power CISC Microcontroller	3	0	0	3
2	MES202	RTOS and its Applications	3	0	0	3
3	MES203	Embedded Networking	3	0	0	3
4	MES204	VLSI Architecture and Design Methodologies	3	0	0	3
5	MES005	**Elective – II** Embedded Linux	3	0	0	3
6	MES010	**Elective – III** Distributed Embedded Computing	3	0	0	3
PRACTICAL						
7	MES231	Advanced Embedded System Laboratory	0	0	4	2
					Total Credits	**20**

SEMESTER III

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1	E4	Elective IV	3	0	0	3
2	E5	Elective V	3	0	0	3
3	E6	Elective VI	3	0	0	3
4	MES331	Project work phase – I	0	0	12	6
					Total Credits	**15**

SEMESTER IV

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1	MES431	Project work phase – II	0	0	24	12
					Total Credits	**12**

TOTAL CREDITS TO BE EARNED FOR THE AWARD OF THE DEGREE - 68

LIST OF ELECTIVES

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1	MES001	Software Technology for Embedded Systems	3	0	0	3
2	MES002	Design of Embedded Control System	3	0	0	3
3	MES003	Embedded Communication and Software Design	3	0	0	3
4	MES004	Embedded Wireless Sensor Networks	3	0	0	3
5	MES005	Embedded Linux	3	0	0	3
6	MES006	RISC Processor Architecture and Programming	3	0	0	3
7	MES007	Advanced Embedded Systems	3	0	0	3
8	MES008	Cryptography and Network Security	3	0	0	3
9	MES009	Computers in Networking and Digital Control	3	0	0	3
10	MES010	Distributed Embedded Computing	3	0	0	3

NATIONAL ENGINEERING COLLEGE, K.R.NAGAR, KOVILPATTI

(An Autonomous Institution Affiliated to Anna University Chennai)

M.E. (EMBEDDED SYSTEMS TECHNOLOGIES)

CURRICULUM AND SYLLABUS (PART TIME)

SEMESTER I

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1	MMA102	Applied Mathematics for Electrical Engineers (Common to M.E EST, M.E HVE and M.E C&I)	3	1	0	4
2	MES101	Real Time Systems	3	0	0	3
3	MES102	Mixed Signal Processor	3	0	0	3
Total Credits						**10**

SEMESTER - II

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1	MES201	Low Power CISC Microcontroller	3	0	0	3
2	MES202	RTOS and its Applications	3	0	0	3
3	MES203	Embedded Networking	3	0	0	3
			Total Credits			**9**

SEMESTER - III

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1	MES103	Advanced Computer Architecture	3	0	0	3
2	MES104	Modern Digital System Design	3	0	0	3
3	MES002	**Elective – I** Design of Embedded Control System	3	0	0	3
Practical						
4	MES131	Embedded System Laboratory	0	0	4	2
			Total Credits			**11**

SEMESTER - IV

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1	MES204	VLSI Architecture and Design Methodologies	3	0	0	3
2	MES005	**Elective – II** Embedded Linux	3	0	0	3
3	MES010	**Elective – III** Distributed Embedded Computing	3	0	0	3
Practical						
4	MES231	Advanced Embedded System Laboratory	0	0	4	2
					Total Credits	**11**

SEMESTER V

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1	E4	Elective IV	3	0	0	3
2	E5	Elective V	3	0	0	3
3	E6	Elective VI	3	0	0	3
4	MES331	Project work phase – I	0	0	12	6
					Total Credits	**15**

SEMESTER VI

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1	MES431	Project Work Phase – II	0	0	24	12
					Total Credits	**12**

LIST OF ELECTIVES

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1	MES001	Software Technology for Embedded Systems	3	0	0	3
2	MES002	Design of Embedded Control System	3	0	0	3
3	MES003	Embedded Communication and Software Design	3	0	0	3
4	MES004	Embedded Wireless Sensor Networks	3	0	0	3
5	MES005	Embedded Linux	3	0	0	3
6	MES006	RISC Processor Architecture and Programming	3	0	0	3
7	MES007	Advanced Embedded Systems	3	0	0	3
8	MES008	Cryptography and Network Security	3	0	0	3
9	MES009	Computers in Networking and Digital Control	3	0	0	3
10	MES010	Distributed Embedded Computing	3	0	0	3

TOTAL CREDITS TO BE EARNED FOR THE AWARD OF THE DEGREE - 68

MMA102 APPLIED MATHEMATICS FOR ELECTRICAL ENGINEERS

L	T	P	C
3	1	0	4

(Common to M.E EST, M.E HVE and M.E C&I)

AIM

To gain knowledge on applied mathematics for electrical engineers

OBJECTIVE

- To learn the concepts of matrix theory
- To understand simplex method, two phase method and graphical solution in linear programming.
- To learn moment generating functions and one dimensional random variables.
- To understand queueing models and computation methods in engineering

UNIT I ADVANCED MATRIX THEORY **9**

Eigen-values using QR transformations - Generalized eigen vectors - Canonical forms - Singular value decomposition and applications - Pseudo inverse - Least square approximations.

UNIT II LINEAR PROGRAMMING **9**

Formulation - Graphical Solution - Simplex Method - Two Phase Method - Transportation and Assignment Problems.

UNIT III ONE DIMENSIONAL RANDOM VARIABLES **9**

Random variables - Probability function - moments - moment generating functions and their properties - Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions - Function of a Random Variable.

UNIT IV QUEUEING MODELS **9**

Poisson Process - Markovian queues - Single and Multi Server Models - Little's formula - Machine Interference Model - Steady State analysis - Self Service queue.

UNIT V COMPUTATIONAL METHODS IN ENGINEERING **9**

Boundary value problems for ODE - Finite difference methods - Numerical solution of PDE - Solution of Laplace and Poisson equations - Liebmann's iteration process - Solution of heat conduction equation by Schmidt explicit formula and Crank - Nicolson implicit scheme - Solution of wave equation.

L=45; T=15; TOTAL: 60 PERIODS

REFERENCES

1. Bronson, R., Matrix Operation, Schaum's outline series, McGraw Hill, New York, 1989.
2. Taha, H. A., Operations Research: An Introduction, Seventh Edition, Pearson Education Edition, Asia, New Delhi (2002).
3. R. E. Walpole, R. H. Myers, S. L. Myers, and K. Ye, Probability and Statistics for Engineers & Scientists, Asia, 8 th Edition, (2007).
4. Donald Gross and Carl M. Harris, Fundamentals of Queueing theory, 2nd edition, John Wiley and Sons, New York (1985).
5. Grewal, B.S., Numerical methods in Engineering and Science, 7th edition, Khanna Publishers, 2009.

MES101 **REAL TIME SYSTEMS** **L T P C**
3 0 0 3

AIM

To expose the students to the fundamentals of Real Time Systems, its communication and evaluation techniques

OBJECTIVE

- To introduce real time computing and scheduling algorithms.
- To understand the programming languages and their tools for real time systems.
- To study real time communication concepts and fault tolerant techniques.
- To study the evaluation techniques of Real time systems.

UNIT I INTRODUCTION **9**

Introduction - Issues in Real Time Computing - Structure of a Real Time System - Task classes - Performance Measures for Real Time Systems - Estimating Program Run Times - Task Assignment and Scheduling - Classical Uniprocessor scheduling algorithms - Uniprocessor scheduling of IRIS tasks - Task assignment - Mode changes and Fault Tolerant Scheduling.

UNIT II PROGRAMMING LANGUAGES AND TOOLS **9**

Programming Languages and Tools - Desired language characteristics - Data typing - Control structures - Facilitating Hierarchical Decomposition, Packages, Run time (Exception) Error handling - Overloading and Generics - Multitasking - Low level programming - Task Scheduling - Timing Specifications - Programming Environments - Run - time support**.**

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**

Real - Time Communication - Communications media, Network Topologies Protocols, Fault Tolerant Routing. Fault Tolerance Techniques - Fault Types - Fault Detection., Fault Error containment Redundancy - Data Diversity - Reversal Checks - Integrated Failure handling.

UNIT V EVALUATION TECHNIQUES **9**

Reliability Evaluation Techniques - Obtaining parameter values, Reliability models for Hardware Redundancy - Software error models. Clock Synchronization - Clock, A Nonfault - Tolerant Synchronization Algorithm - Impact of faults - Fault Tolerant Synchronization in Hardware - Fault Tolerant Synchronization in software.

TOTAL : 45 PERIODS

REFERENCES

1. C.M. Krishna, Kang G. Shin, "Real - Time Systems", McGraw - Hill International Editions, 1997.
2. Rajib Mall, "Real-time systems: theory and practice", Pearson Education, 2007.
3. Peter D.Lawrence, "Real Time Micro Computer System Design - An Introduction", McGraw Hill, 1988.
4. Stuart Bennett, "Real Time Computer Control - An Introduction", Prentice Hall of India, 1998.
5. S.T. Allworth and R.N.Zobel, "Introduction to real time software design", Macmillan, 2nd Edition, 1987.
6. R.J.A Buhur, D.L Bailey, "An Introduction to Real - Time Systems", Prentice – Hall International, 1999.
7. Philip.A.Laplante, "Real Time System Design and Analysis", Prentice Hall of India, 3rd Edition, April 2004.

MES102	MIXED SIGNAL PROCESSOR	L	T	P	C
		3	0	0	3

AIM

To impart knowledge on Mixed Signal Processor, its architecture and interfacing.

OBJECTIVE

- To understand the processor classification and its architecture's.
- To understand the architecture of MSP430 Processor.
- To study the interfacing techniques of the processor.
- To study the on-chip peripheral's and special features of the processor.

UNIT I INTRODUCTION **9**

Embedded System Definition – Processor classification – RISC and CISC architecture comparison - Low Power embedded systems – Target applications.

UNIT II ARCHITECTURE **9**

MSP430 RISC CPU architecture - On-chip peripherals - low power RF capabilities - Instruction set- Clock system- Memory subsystem-Key differentiating factors between different MSP430 families

UNIT III INTERFACING TECHNIQUES **9**

Interrupt handling mechanism – Interfacing techniques - Digital I/O ports - Interfacing LED, LCD, External memory- Seven segment LED modules interfacing. Example – Real Time Clock.

UNIT IV ON CHIP PERIPHERALS **9**

On chip peripherals - Watchdog Timer – Comparator - Op-Amp - Timers - Real Time Clock (RTC) – ADC – DAC - LCD - DMA.

UNIT V SPECIAL FEATURES **9**

Low power features of MSP430 - Clock system – low power modes - Clock request feature - programming using C and assembly language - mixing scheme of the MSP430 pins.

TOTAL : 45 PERIODS

REFERENCES

1. Raj Kamal, "Microcontrollers: Architecture, Programming, Interfacing and System Design" Pearson Education, 2005.
2. John Davies, "MSP430 Microcontroller Basics", Elsevier, 2008.
3. MSP430 Teaching CD-ROM, Texas Instruments, 2008 (http://www.uniti.in).
4. Jerry Luecke, "Analog and Digital Circuits for Electronic Control System Applications", Elsevier, 2010.
5. Chris Nagy, "Embedded Systems Design Using TI MSP 430 series", Elsevier, 2008.

MES103 ADVANCED COMPUTER ARCHITECTURE

L	T	P	C
3	0	0	3

AIM

To learn advanced computer architecture and their processing.

OBJECTIVE

- To learn the concepts of parallel computing.
- To study the program portioning, scheduling and performance analysis.
- To understand the data path design and memory organization.
- To understand parallel processing and architectures.

UNIT I PARALLEL COMPUTING **9**

Computing and Computers - Parallel Computer models - the state of computing - Multiprocessors and Multicomputers – Multivectors - and SIMD computers - superscalar and vector processors - PRAM and VLSI models - Program and network properties - Conditions of parallelism.

UNIT II SCHEDULING AND PERFORMANCE ANALYSIS **9**

Speed up techniques - 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 DATA PATH DESIGN **9**

Fixed point and floating point arithmetic - Control design - Hardwired and micro programmed control - CPU control unit - memory hierarchy technology - virtual memory technology - cache memory organizations - shared memory organizations

UNIT IV PARALLEL COMPUTER ARCHITECTURES **9**

Pipeline design and performance - Instruction pipeline - Pipeline control - Superscalar processing - RISC and CISC processors - Parallel and scalable architectures - Multithreaded data flow architectures.

UNIT V PARALLEL PROCESSING **9**

Parallel models - Languages and compilers - Parallel program development and environments - UNIX for parallel computers

TOTAL: 45 PERIODS

REFERENCES

1. Kai Hwang "Advanced Computer Architecture". McGraw Hill International 2001.
2. Dezso Sima, Terence Fountain, Peter Kacsuk, "Advanced computer Architecture - A design Space Approach". Pearson Education, 2003.
3. David E. Culler, Jaswinder Pal Singh with Anoop Gupta "Parallel Computer Architecture", Elsevier, 2004.
4. John P. Shen. "Modern processor design Fundamentals of super scalar processors", Tata McGraw Hill 2003.
5. Sajjan G. Shiva "Advanced Computer Architecture", Taylor & Francis, 2008.
6. V.Rajaraman, C.Siva Ram Murthy, "Parallel Computers- Architecture and Programming",Prentice Hall India, 2008.
7. John L. Henhnessy, David A. Petterson, "Computer Architecture: A Quantitative Approach", 4th Edition, Elsevier, 2007.

MES104 MODERN DIGITAL SYSTEM DESIGN

L	T	P	C
3	0	0	3

AIM

To understand the models and schemes of digital system design

OBJECTIVE

- To realize Mealy and Moore model networks
- To learn the design techniques of fundamental mode asynchronous circuits
- To study the various fault models of system design
- To impart knowledge on programmable logic devices and advanced PLD

UNIT I REALIZATION OF MEALY AND MOORE MODEL NETWORKS 9

Analysis of Clocked Mealy and Moore model Networks, Modelling of Mealy and Moore network - State Stable Assignment and Reduction - Design of Mealy and Moore model networks - Design of Iterative Circuits - ASM Chart - ASM Realizations using Discrete gates, Multiplexers, PLA, PROMs.

UNIT II DESIGN OF FUNDAMENTAL MODE ASYNCHRONOUS CIRCUITS 9

Fundamental mode Asynchronous Sequential Circuit analysis –Excitation Table, Transition Table, State Table, Flow Table and its Reduction - Races, Primitive Flow Table - State Assignment Problem - Design of Fundamental mode asynchronous sequential circuits – Timing Hazards - Design of a Microcontroller CPU,

UNIT III FAULT MODELS AND DFT SCHEMES 9

Stuck at Models, Fault Table method - Path Sensitization Method - Boolean Difference Method - Kohavi Algorithm - Tolerance Techniques - The Compact Algorithm - Practical PLA's - Fault in PLA - Test Generation - Masking Cycle - DFT Schemes - Built-in Self Test.

UNIT IV PROGRAMMABLE LOGIC DEVICES 9

Programming Techniques -Re-Programmable Devices Architecture- Function blocks, I/O blocks, Interconnects, Realize combinational, Arithmetic, Sequential Circuit with Programmable Logic Array; Architecture and application of Field Programmable Logic Sequence.

UNIT V ADVANCED PROGRAMMABLE LOGIC DEVICES 9

Architecture of GAL, EPLD, EPLA , PEEL, PML; PROM – Altera CPLD – Xilinx XC9500 CPLD - FPGA - Xilinx FPGA - Xilinx 4000

TOTAL: 45 PERIODS

REFERENCES

1. Donald G. Givone, "Digital principles and Design", Tata McGraw Hill 2002.
2. Stephen Brown and Zvonk Vranesic, "Fundamentals of Digital Logic with VHDL Deisgn", Tata McGraw Hill, 2002.
3. Mark Zwolinski, "Digital System Design with VHDL", Pearson Education, 2004.
4. Parag K Lala, "Digital System design using PLD", BS Publications, 2003.
5. John M Yarbrough, "Digital Logic applications and Design", Thomson Learning, 2001.
6. Nripendra N Biswas, "Logic Design Theory", Prentice Hall of India, 2001.
7. Charles H. Roth Jr., "Fundamentals of Logic design", Thomson Learning, 2004.

MES131 EMBEDDED SYSTEM LABORATORY

L	T	P	C
0	0	4	2

AIM

To impart knowledge on different embedded processors, their architectures and programming.

OBJECTIVE

- To understand the Architecture of MSP430 chip using Cross Works Development Environment.
- To interface MSP chip with interfacing modules to develop single chip solutions on Cross Works Development Environment.
- To understand the Architecture of ARM7 Processor using Cross Works Development Environment.
- To understand the use of RTOS with ARM7 Processor using Cross Works Development Environment.

LIST OF EXPERIMENTS

PART- I

Write programs to understand the Architecture of MSP430 chip using Cross Works Development Environment.

1. Data Transfer - Block move, Exchange, Sorting, Finding largest element in an array.
2. Arithmetic Instructions - Addition/subtraction, multiplication and division,
3. Square, Cube - (16 bits Arithmetic operations - bit addressable).
4. Counters design.
5. Boolean & Logical Instructions (Bit manipulations).
6. Conditional CALL & RETURN.
7. Code conversion: BCD - ASCII; ASCII - Decimal; Decimal - ASCII; HEX - Decimal and Decimal - HEX.
8. Programs to generate delay, programs using serial port and on-Chip timer / counter.

PART- II

Write programs to interface MSP chip with Interfacing modules to develop single chip solutions on Cross Works Development Environment.

9. Write a Program to test the ADC Signal by using 8-LEDs array.
10. Write a program to study on board relay.
11. External ADC and Temperature control interface to MSP
12. Stepper and Bi directional DC motor control interface to MSP
13. Alphanumeric LCD panel and Hex keypad input interface to MSP.
14. Generate different waveforms Sine, Square, Triangular and Ramp using DAC interface to MSP.
15. Simple Calculator Using 6 digit seven segment display and Hex Keyboard

PART- III

Write programs to understand the Architecture of ARM7 Processor using Cross Works Development Environment.

16. Simple Assembly Program for
    a. Addition | Subtraction | Multiplication | Division
17. 8 Bit LED and Switch Interface
18. Buzzer Relay and Stepper Motor Interface
19. Time delay program using built in Timer / Counter feature
20. External Interrupt
21. Displaying a number in 7-Segment Display
22. 4x4 Matrix Keypad Interface
23. Multi digit Seven segment display
24. Displaying a message in a 2 line x 16 Characters LCD display
25. ADC and Temperature sensor LM 35 Interface
26. I2C Interface – 7 Segment display
27. I2C Interface – Serial EEPROM
28. Transmission from Kit and reception from PC using Serial Port
29. Generation of PWM Signal

PART- IV

Write programs to understand the use of RTOS with ARM7 Processor using Cross Works Development Environment.

30. Blinking two different LEDs at different timings.
31. Displaying two different messages in LCD display in two lines
32. Sending messages to mailbox by one task and reading the message from mailbox by another task
33. Sending message to PC through serial port by three different tasks on priority Basis
34. Reading temperature from LM35 chip and any other external element at different timings using RTOS.

MES201 LOW POWER CISC MICROCONTROLLER

L	T	P	C
3	0	0	3

AIM

To learn the concept of CISC architecture and peripheral interfacing

OBJECTIVE

- To learn the basic concept of microcontrollers.
- To study the basic processor core of RL78 and their software development tools.
- To study the interrupts and interrupt processing activities of RL78.
- To understand the basic concepts of serial communication and Timers.

UNIT I MICROCONTROLLER CONCEPTS **9**

Microcontroller-based Embedded System - Infrastructure: Power, Clock, and Reset - Interfacing with Digital Signals: GPIO, Driving a Common Signal with Multiple MCUs, Scanning Matrix Keypads, Driving Motors and Coils - Interfacing with Analog Signals : Multi-bit Analog to Digital Conversion- Introduction about RENESAS Family of microcontrollers.

UNIT II RL78 PROCESSOR CORE **9**

RL78 Processor Core basics – Block Diagram - Data flow diagram within core – Instruction set- Addressing Modes- RL78 Pipeline structure – Implementation of C language statements in RL78Assembly language- - Programming Examples- Software development tools for RL78**.**

UNIT III RL78 INTERRUPTS **9**

RL78 Interrupt mechanisms- Interrupt processing activities: both hardware and software with ISR examples- Interrupt Characteristics- RL78 Interrupt vector table-Concurrent Interrupt - External Interrupt-Program using two ISRs to implement a Quadrature shaft encoder.

UNIT IV SERIAL COMMUNICATION **9**

Basic Concepts: Synchronous, Asynchronous – Example Protocols: CSI, UART, I^2C - Serial Array Unit Concepts : CSI Mode , UART Mode , Simplified IIC Mode - Serial Communications Device Driver Code - Programming Examples for serial communication.

UNIT V TIMER PERIPHERALS **9**

Basic Concepts: - Interval Timer - Timer Array Unit: Independent Channel Operation Modes, Simultaneous Channel Operation Modes - Using PWM Mode to Control a Servo Motor - Programming Examples.

TOTAL: 45 PERIODS

REFERENCES

1. G.Alexander, M.Conrad, "Embedded Systems using Renesas RL78 Microcontroller", Micrium Press,2012.
2. J.Ganssle, "The Art of Designing Embedded systems ", Newnes, 2008.
3. RL78 Family User's Manual: RENESAS Electronics, 2011.
4. www.renesassingapore.com

MES202	RTOS AND ITS APPLICATIONS	L	T	P	C
		3	0	0	3

AIM

To understand the real time operating system concepts, exemplary RTOS and their application domains.

OBJECTIVE

- To review the concepts of basic RTOS systems
- To learn the models of distributed operating systems and design strategies.
- To study the real time kernel and various real time models.
- To know the application domains of RTOS.

UNIT -I REVIEW OF OPERATING SYSTEMS 9

Basic Principles - System Calls - Files - Processes - Design and Implementation of processes - Communication between processes - Operating System structures.

UNIT – II DISTRIBUTED OPERATING SYSTEMS 9

Topology - Network types - Communication - RPC - Client server model -Distributed file system - Design strategies.

UNIT – III REAL TIME MODELS AND LANGUAGES 9

Event Based - Process Based and Graph based Models - Petrinet Models - Real Time Languages - RTOS Tasks - RT scheduling - Interrupt processing - Synchronization - Control Blocks - Memory Requirements.

UNIT – IV REAL TIME KERNEL 9

Principles - Design issues - Polled Loop Systems - RTOS Porting to a Target -Comparison and study of various RTOS like QNX - VX works - PSOS - C Executive - Case studies.

UNIT – V RTOS APPLICATION DOMAINS 9

RTOS for Image Processing - Embedded RTOS for voice over IP - RTOS for fault Tolerant Applications - RTOS for Control Systems.

TOTAL: 45 PERIODS

REFERENCES:

1. Herma K., “Real Time Systems - Design for distributed Embedded Applications”, Kluwer Academic, 1997.
2. Charles Crowley, “Operating Systems-A Design Oriented approach” McGraw Hill 1997.
3. C.M. Krishna, Kang, G.Shin, “Real Time Systems”, McGraw Hill, 1997.
4. Raymond J.A.Bhur, Donald L.Bailey, “An Introduction to Real Time Systems”, PHI 1999.
5. Raj Kamal, "Embedded Systems- Architecture, Programming and Design", Tata McGraw Hill, 2006.

MES203 EMBEDDED NETWORKING

L	T	P	C
3	0	0	3

AIM

To learn the wired and wireless embedded networking strategies.

OBJECTIVE

- To study the embedded communication protocols.
- To study the USB and CAN bus and their interfacing.
- To learn the basics of Ethernet.
- To understand the embedded Ethernet and wireless embedded networking.

UNIT – I EMBEDDED COMMUNICATION PROTOCOLS **9**

Embedded Networking: Introduction-Serial/Parallel Communication - Serial communication protocols-RS232 standard - RS485 - Synchronous Serial Protocols - Serial Peripheral Interface (SPI) - Inter Integrated Circuits (I^2C)- PC Parallel port programming -ISA/PCI Bus protocols

UNIT – II USB AND CAN BUS **9**

USB bus - Introduction - Speed Identification on the bus - USB States - USB bus communication: Packets -Data flow types-Enumeration-Descriptors-ARM Microcontroller USB Interface Programs -CAN Bus - Introduction - Frames –Bit stuffing-Types of errors - Nominal Bit Timing - ARM Microcontroller CAN Interface Programs -A simple application Program with CAN and ARM Microcontroller

UNIT – III ETHERNET BASICS **9**

Elements of a network- Inside Ethernet- Building a Network: Hardware options-Cables, Connections and network speed- Design choices: Selecting components Ethernet Controllers - Using the internet in local and internet communications - Inside the Internet protocol- A simple application Program with Ethernet and ARM Microcontroller

UNIT – IV EMBEDDED ETHERNET **9**

Exchanging messages using UDP and TCP - Serving web pages with Dynamic Data -Serving web pages that respond to user Input - Email for Embedded Systems - Using FTP- Keeping Devices and Network secure.

UNIT – V WIRELESS EMBEDDED NETWORKING **9**

Wireless sensor networks- Introduction - Applications - Network Topology - Localization-Time Synchronization- Energy efficient MAC protocols-SMAC – Energy Efficient and robust routing - Data Centric routing

TOTAL: 45 PERIODS

REFERENCES:

1. Frank Vahid, Givargis ‘Embedded Systems Design: A Unified Hardware/Software Introduction’,Wiley Publications, 2001.
2. Jan Axelson,‘Parallel Port Complete’, Penram publications, 1997.
3. Dogan Ibrahim, ‘Advanced PIC microcontroller projects in C’, Elsevier, 2008.
4. Jan Axelson ‘Embedded Ethernet and Internet Complete’, Penram publications, 2003.
5. Bhaskar Krishnamachari, ‘Networking wireless sensors’, Cambridge press 2005.

MES204 VLSI ARCHITECTURE AND DESIGN METHODOLOGIES

L	T	P	C
3	0	0	3

AIM

To impart knowledge on VLSI architecture and design methodologies.

OBJECTIVE

- To study analog and high speed VLSI technology
- To learn programmable ASIC design software.
- To study the concepts of logic synthesis, simulation and testing.

UNIT I INTRODUCTION **9**

Overview of digital VLSI design methodologies - Trends in IC Technology - Advanced Boolean algebra - Shannon's expansion theorem - Consensus theorem - Octal designation- Run measure - Buffer gates - Gate expander - Reed Muller expansion - Synthesis of multiple output combinational logic circuits by product map method - Design of static hazard free, dynamic hazard free logic circuits.

UNIT II ANALOG VLSI AND HIGH SPEED VLSI **9**

Introduction to analog VLSI - Realization of neural networks and switched capacitor filters - Submicron technology and Gas VLSI Technology.

UNIT III PROGRAMMABLE ASICS **9**

Anti fuse - static RAM - EPROM and technology - PREP bench marks - Actel ACT Xilinx LCA - Altera flex - Altera MAX DC & AC inputs and outputs - Clock and power inputs - Xilinx I/O blocks.

UNIT IV PROGRAMMABLE ASIC DESIGN SOFTWARE **9**

Actel ACT - Xilinx LCA - Xilinx EPLD - Altera MAX 5000 and 7000 - Altera MAX 9000 -design systems - logic synthesis - half gate - schematic entry - Low level design language -PLA tools - EDIF - CFI design representation.

UNIT V LOGIC SYNTHESIS, SIMULATION AND TESTING **9**

Basic features of VHDL language for behavioral modeling and simulation - Summary of VHDL data types - Dataflow and structural modeling - VHDL and logic synthesis - Circuit and layout verification - Types of simulation - Boundary scan test - Fault simulation - Automatic test pattern generation - design examples.

TOTAL: 45 PERIODS

REFERENCES:

1. William I. Fletcher, "An Engineering Approach to Digital Design", Prentice Hall of India, 1980.
2. Amar Mukharjee,"Introduction to NMOS and CMOS VLSI System Design", Prentice Hall, 1986.
3. M.J.S. Smith, "Application - specific integrates circuits", Addison Wesley LongmanInc, 1997.
4. Frederick J.Hill and Gerald R.Peterson, "Computer Aided Logical Design with emphasis on VLSI" 1993.

MES231 ADVANCED EMBEDDED SYSTEM LABORATORY

L	T	P	C
0	0	4	2

AIM

To understand the architecture of embedded processors and to design simple systems.

OBJECTIVE

- To understand the architecture and developing simple systems which contains both Analog and Digital logic blocks.
- To understand the architecture of RENESAS and interfacing external peripherals.
- To understand the architecture of OMAP and interfacing external peripherals.

PART I PSoC

Experiments to understand the architecture and developing simple systems which contains both Analog and Digital logic blocks.

1 LED Blinking : Software Control
2 LED Blinking : Hardware Control
3 LED Blinking : PWM Control
4 Moving LCD Display
5 Interrupt generation using timer
6 ADC-LCD Interface
7 Capsense – Buttons and Sliders test

PART II RENESAS

Experiments to understand the architecture and interfacing external peripherals.

1. Measure room temperature and display the same in a LCD with keyboard interaction
2. Design a real time clock using 7- segment displays and create keyboard interaction for the operations.
3. Create a Foreground – background application system using interrupt structure of RL78
4. Design an embedded system to measure the unknown signal frequency using timer/counter of RL78
5. Generate 3-phase PWM signals and demonstrate the utility of PWM with high bright LED lights.

PART III OMAP

Experiments to understand the architecture and interfacing external peripherals.

MES001 SOFTWARE TECHNOLOGY FOR EMBEDDED SYSTEMS

L	T	P	C
3	0	0	3

AIM

To study the software technologies and programming concepts of embedded system

OBJECTIVE

- To understand the programming concepts of embedded systems
- To learn embedded C programming concepts
- To study the design and analysis of software development process
- To study web architectural framework protocols and unified modeling language

UNIT I PROGRAMMING EMBEDDED SYSTEMS 9

Embedded Program - Role of Infinite loop - Compiling, Linking and locating downloading and debugging - Emulators and simulators processor – External peripherals - Types of memory - Memory testing - Flash Memory.

UNIT II C AND ASSEMBLY 9

Overview of Embedded C - Compilers and Optimization - Programming and Assembly Register usage conventions - typical use of addressing options - instruction sequencing procedure call and return - parameter passing - retrieving parameters - everything in pass by value - temporary variables

UNIT III. EMBEDDED PROGRAM AND SOFTWARE DEVELOPMENT PROCESS 9

Program Elements - Queues - Stack- List and ordered lists-Embedded programming in C++ - Inline Functions and Inline Assembly - Portability Issues - Embedded Java Software Development process: Analysis - Design- Implementation - Testing - Validation- Debugging - Software maintenance

UNIT IV UNIFIED MODELLING LANGUAGE 9

Object State Behaviour - UML State charts - Role of Scenarios in the Definition of Behaviour - Timing Diagrams - Sequence Diagrams - Event Hierarchies - Types and Strategies of Operations - Architectural Design in UML Concurrency Design - Representing Tasks - System Task Diagram - Concurrent State Diagrams - Threads. Mechanistic Design - Simple Patterns

UNIT V WEB ARCHITECTURAL FRAMEWORK FOR EMBEDDED SYSTEM 9

Basics - Client/sever model- Domain Names and IP address – Internet Infrastructure and Routing - URL - TCP/IP protocols - Embedded as Web Client - Embedded Web servers - HTML - Web security - Case study Web-based Home Automation system.

TOTAL: 45 PERIODS

REFERENCES

1. David E.Simon, "An Embedded Software Primer", Pearson Education, 2003.
2. Michael Barr, "Programming Embedded Systems in C and C++", Oreilly, 2003.
3. H.M. Deitel , P.J.Deitel, A.B. Golldberg " Internet and World Wide Web - How to Program" 3rd Edition , Pearson Education , 2008.
4. Bruce Powel Douglas, "Renal-Time UML: Developing Efficient Object for Embedded Systems", 2nd edition , Addison-Wesley, 1999.
5. Daniel W.lewis, "Fundamentals of Embedded Software where C and Assembly meet", PHI 2002.
6. Raj Kamal, "Embedded Systems- Architecture, Programming and Design", Tata McGraw Hill, 2006.

MES002 DESIGN OF EMBEDDED CONTROL SYSTEM

L	T	P	C
3	0	0	3

AIM

To learn the methods of designing and interfacing embedded systems.

OBJECTIVE

- To learn the basics of embedded system hardware organization.
- To understand the basics of real time operating system
- To learn the design methodologies and hardware and software interface
- To study the designing concepts of software for embedded system, basics of exemplary RTOS

UNIT I EMBEDDED SYSTEM ORGANIZATION 9

Embedded computing - characteristics of embedded computing applications - embedded system design challenges; Build process of Real time Embedded system -Selection of processor; Memory; I/O devices-Rs-485, MODEM, Bus Communication system using I^2C, 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 – Non maskable 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 – VX Works, 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

1. Steven F. Barrett, Daniel J. Pack, "Embedded Systems - Design and Applications with the 68HC12 and HCS12", Pearson Education, 2008.
2. Raj Kamal, "Embedded Systems- Architecture, Programming and Design" Tata McGraw Hill,2006.
3. Micheal Khevi, "The M68HC11 Microcontroller application in control, Instrumentation & Communication", PH NewJersy, 1997.
4. Muhammad Ali Mazidi, Rolin D. Mckinlay, Danny Causey, "PIC Microcontroller and Embedded Systems- Using Assembly and C for PIC18", Pearson Education,2008.
5. Daniel W. Lewis, "Fundamentals of Embedded Software", Prentice Hall India, 2004.
6. Jack R Smith "Programming the PIC microcontroller with MBasic" Elsevier, 2007.
7. Keneth J.Ayala, "The 8086 Microprocessor: Programming & Interfacing the PC", Thomson India edition, 2007.

MES003	EMBEDDED COMMUNICATION AND SOFTWARE DESIGN	L	T	P	C
		3	0	0	3

AIM

To study the methodologies of embedded communication and software design

OBJECTIVE

- To review the basics of OSI reference model and basics of OS and RTOS
- To study routers, switch, protocol and debugging concepts
- To study the concepts of structure and tables.
- To understand the management of devices, timer, buffer and router.
- To learn multi board communication software design.

UNIT I INTRODUCTION 9

Communication Devices - Communication Echo System - Design Consideration – Host Based Communication - Embedded Communication System - OS Vs RTOS.

UNIT II SOFTWARE PARTITIONING 9

Limitation of strict Layering - Tasks & Modules - Modules and Task Decomposition Layer2 Switch - Layer3 Switch / Routers - Protocol Implementation - Management Types- Debugging Protocols.

UNIT III TABLE & DATA STRUCTURES 9

Partitioning of Structures and Tables - Implementation - Speeding Up access - Table Resizing - Table access routines - Buffer and Timer Management - Third Party Protocol Libraries.

UNIT IV MANAGEMENT SOFTWARE 9

Device Management - Management Schemes - Router Management - Management of Sub System Architecture - Device to manage configuration - System Start up and configuration.

UNIT V MULTI BOARD COMMUNICATION SOFTWARE DESIGN 9

Multi Board Architecture - Single control Card and Multiple line Card Architecture -Interface for Multi Board software - Failures and Fault - Tolerance in Multi Board Systems - Hardware independent development - Using a COTS Board - Development Environment - Test Tools.

TOTAL: 45 PERIODS

REFERENCES

1. Sridhar .T, "Designing Embedded Communication Software" CMP Books, 2003.
2. Comer.D, "Computer networks and Internet", Third Edition, Prentice Hall, 2008.
3. Raj Kamal, "Embedded Systems- Architecture, Programming and Design" Tata McGraw Hill, 2006.

MES004 EMBEDDED WIRELESS SENSOR NETWORKS

L	T	P	C
3	0	0	3

AIM

To study the concepts of embedded wireless sensor networks.

OBJECTIVES

- To discuss about the Adhoc networks and applications of sensor networks
- To implement the network architecture, operating systems and optimization goals.
- To study about the protocols and sensors for wireless networks
- To learn about the Smart sensors and Commercial motes for implementation

UNIT I FUNDAMENDALS OF WIRELESS SENSOR NETWORKS 8

Introduction – Sensor network application classes: System Evaluation metrices, Individual node evaluation metrices, Hardware capabilities, Challenges for Wireless Sensor Networks - Characteristics requirements - required mechanisms, Difference between mobile Adhoc and sensor networks

UNIT II NETWORK ARCHITECTURES AND DESIGN GOALS 9

Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT III NETWORK PROTOCOLS AND ROUTING 10

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC, The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing, Geographic Routing.

UNIT IV SMART SENSORS 10

Introduction to smart sensors – Evolution - Signal conditioning - Analog and Digital interface circuits – Components – General architecture of smart sensors – Humidity and Temperature sensors – Moisture sensors – Vibration sensors - Level sensors – Pressure sensors – Ultra sonic sensors – Pattern sensors – Vision sensors

UNIT V COMMERCIAL MOTES 8

Typical architecture of sensor motes – Components - RF mote – Mini mote – Mica mote – Micaz mote – Intel mote – Laser mote – CCR mote – Applications: Wildfire monitoring – Habitat monitoring.

REFERENCES:

1.Holger Karl & Andreas Willig, "Protocols And Architectures for Wireless Sensor Networks", John Wiley, 2005.

2. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

3. Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks - Technology, Protocols, and Applications", John Wiley, 2007.

4. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.

5. Bhaskar Krishnamachari, "Networking Wireless Sensors", Cambridge Press,2005.

6. www.smartsensors.com

7. www.sick.com

MES005 **EMBEDDED LINUX**

L	T	P	C
3	0	0	3

AIM

To study the basics of LINUX and to gain knowledge on Embedded LINUX

OBJECTIVE

- To review the basics of LINUX fundamentals
- To introduce embedded Linux and its concepts
- To study the bootloader, role of bootloader and universal bootloader concepts.
- To understand power management, interrupt management, timer management and device drivers.

UNIT I LINUX FUNDAMENTALS 10

Introduction to Linux - Basic Linux commands and concepts - Shells - Advanced shells and shell scripting - Linux File System: concepts, types, representation.

UNIT II INTRODUCTION TO EMBEDDED LINUX 8

Embedded Linux - Introduction - Advantages- Embedded Linux Distributions - Architecture - Linux kernel architecture - User space - linux startup sequence - GNU cross platform Tool chain

UNIT III BOOTLOADERS 8

Bootloader definition – role of bootloader – bootloader Challenges- Universal bootloader - Porting Universal bootloader – Device tree Blob

UNIT IV BOARD SUPPORT PACKAGE AND EMBEDDED STORAGE 10

Inclusion of BSP in kernel build procedure - - Memory Map - Interrupt Management - - Timers - UART - Power Management - Embedded Storage - Flash Map - Memory Technology Device (MTD) –MTD Architecture - MTD Driver for NOR Flash - The Flash Mapping drivers

UNIT V DEVICE DRIVERS 9

Device driver introduction – driver methods-Building and running modules - Communicating with hardware –USB Driver :Basics, USB and Sysfs- USB Urbs-writing a USB device driver

TOTAL: 45 PERIODS

REFERENCES

1. Dhananjay M. Dhamdhere, "Operating Systems A concept based Approach", Tata Mcgraw-Hill Publishing Company Ltd.
2. Matthias Kalle Dalheimer, Matt Welsh, "Running Linux", O'Reilly Publications 2005.
3. Mark Mitchell, Jeffrey Oldham and Alex Samuel, "Advanced Linux Programming" New Riders Publications 2008.
4. P.Raghavan,Amol Lad,Sriram Neelakandan, "Embedded Linux System Design and Development", Auerbach Publications 2006.
5. Karim Yaghmour, "Building Embedded Linux Systems", O'Reilly Publications 2003.
6. Christopher Hallinan,"Embedded Linux Primer" second edition,Pearson education 2012.
7. M.Beck,H.Bohme, "Linux kernel Programming" Third edition,Pearson education 2004.
8. Greg Kroah Heartman, Jonathan corbet, " Linux Device Drivers", O'Reilly Publications 2005.

MES006 RISC PROCESSOR ARCHITECTURE AND PROGRAMMING

L	T	P	C
3	0	0	3

AIM

To gain knowledge on architecture and programming of RISC processor

OBJECTIVE

- To learn the architecture and instruction set of ARM 9 processor
- To study the architecture of CORTEX M3 processor
- To study the architecture of CORTEX A9 processor

UNIT I ARM920T ARCHITECTURE 9

Advanced RISC Machine (ARM) Family- different technologies from ARM - ARM920T processor Core & Architectures - ARM Programmer's model : Registers, Interrupt, Exception handling

UNIT II ARM920T INSTRUCTION SET 9

ARM Instruction set: Data processing, Branch, SWI, SWP, CDP, and CoProcessor data transfer instructions - Thumb instruction set: Different Formats - ARM Assembly Language Programming examples

UNIT III ARM920T INTERNAL PERIPHERALS 9

Memory controller - I/O Ports - Nand flash controller -Timer -UART - USB device controller - Real time clock (RTC) - ADC & Touch screen interface

UNIT IV CORTEX A9 9

Introduction Cortex A9: Features, Varients, Configurable options – top level functional diagram - Programmer's model –NEON Technology-Preload Engine-Memory Management Unit-Debug interface

UNIT V CORTEX M3 9

Introduction Cortex M3: Features, Varients, Configurable options –top level functional diagram - Programmer's model - Memory Protection Unit-Nested Vector interrupted controller-Embedded Trace Macro Cell.

TOTAL: 45 PERIODS

REFERENCES

1. Steve Furber, “ARM system on chip architecture”, Addision Wesley, 2001.
2. Andrew N. Sloss, Dominic Symes, Chris Wright, John Rayfield, “ARM System Developer's Guide Designing and Optimizing System Software”, Elsevier 2007.
3. Cortex A9 User Manual
4. www.arm.com
5. User’s Manual: S3C2410X
6 . Cortex M3 User Manual

MES007 **ADVANCED EMBEDDED SYSTEMS**

L	T	P	C
3	0	0	3

AIM

To impart knowledge on designing and modeling of advanced embedded system

OBJECTIVE

- To review the hardware and software of embedded systems
- To learn system modeling and partitioning of hardware and software
- To study hardware software co-synthesis and concurrent design process models
- To study memory types and interfacing peripherals with embedded systems

UNIT I INTRODUCTION TO EMBEDDED HARDWARE AND SOFTWARE 9

Terminology - Gates - Timing diagram - Memory - Microprocessor buses – Direct memory access - Interrupts - Built interrupts - Interrupts basis - Shared data problems - Interrupt latency - Embedded system evolution trends - Interrupt routines in an RTOS environment .

UNIT II SYSTEM MODELLING WITH HARDWARE/SOFTWARE PARTITIONING 9

Embedded systems, Hardware/Software Co-Design, Co-Design for System Specification and modelling- Single-processor Architectures & Multi-Processor Architectures, comparison of Co-Design Approaches, Models of Computation, Requirements for Embedded System Specification, Hardware/Software Partitioning Problem, Hardware/Software Cost Estimation, Generation of Partitioning by Graphical modelling, Formulation of the HW/SW scheduling, Optimization.

UNIT III HARDWARE/SOFTWARE CO-SYNTHESIS 9

The Co-Synthesis Problem, State-Transition Graph, Refinement and Controller Generation, Distributed System Co-Synthesis.

UNIT IV MEMORY AND INTERFACING 9

Memory: Memory write ability and storage performance - Memory types – composing memory - Advance RAM interfacing communication basic - Microprocessor interfacing I/O addressing - Interrupts - Direct memory access - Arbitration multilevel bus architecture - Serial protocol - Parallel protocols - Wireless protocols - Digital camera example.

UNIT V CONCURRENT PROCESS MODELS AND HARDWARE SOFTWARE CO-DESIGN 9

Modes of operation - Finite state machines - Models - HCFSL and state charts language - state machine models - Concurrent process model - Concurrent process - Communication among process -Synchronization among process - Implementation - Data Flow model. Design technology - Automation synthesis - Hardware software co-simulation - IP cores - Design Process Model.

TOTAL: 45 PERIODS

REFERENCES

1. David. E. Simon, "An Embedded Software Primer", Pearson Education, 2001.
2. Tammy Noergaard, "Embedded System Architecture, A comprehensive Guide for Engineers and Programmers", Elsevier, 2006
3. Raj Kamal, "Embedded Systems- Architecture, Programming and Design" Tata McGraw Hill, 2006.
4. Frank Vahid and Tony Gwargie, "Embedded System Design", John Wiley & sons, 2002.
5. Steve Heath, "Embedded System Design", Elsevier, Second Edition, 2004.
6. Ralf Niemann, "Hardware/Software Co-Design for Data Flow Dominated Embedded Systems", Kluwer Academic Pub, 1998.
7. Jorgen Staunstrup, Wayne Wolf, "Hardware/Software Co-Design: Principles and Practice", Kluwer Academic Pub,1997.
8. Giovanni De Micheli, Rolf Ernst Morgon, "Reading in Hardware/Software Co-Design" Kaufmann Publishers, 2001.

MES008 CRYPTOGRAPHY AND NETWORK SECURITY

L	T	P	C
3	0	0	3

AIM

To study the concepts of cryptography and methods of securing the network

OBJECTIVE

- To learn encryption techniques and use of ciphers.
- To gain knowledge on public key encryption hash function and authentication protocols.
- To learn network security practice, key management and authentication.
- To know the methods of keeping the system secure

UNIT I SYMMETRIC CIPHERS 9

Overview - classical Encryption Techniques - Block Ciphers and the Data Encryption standard - Introduction to Finite Fields - Advanced Encryption standard - Contemporary Symmetric Ciphers - Confidentiality using Symmetric Encryption.

UNIT II PUBLIC-KEY ENCRYPTION AND HASH FUNCTIONS 9

Introduction to Number Theory - Public-Key Cryptography and RSA - Key Management - Diffie-Hellman Key Exchange - Elliptic Curve Cryptography - Message Authentication and Hash Functions - Hash Algorithms - Digital Signatures and Authentication Protocols.

UNIT III NETWORK SECURITY PRACTICE 9

Authentication Applications - Kerberos - X.509 Authentication Service - Electronic mail Security - Pretty Good Privacy - S/MIME - IP Security architecture – Authentication Header - Encapsulating Security Payload - Key Management.

UNIT IV SYSTEM SECURITY 9

Intruders - Intrusion Detection - Password Management - Malicious Software - Firewalls - Firewall Design Principles - Trusted Systems.

UNIT V WIRELESS SECURITY 9

Introduction to Wireless LAN Security Standards - Wireless LAN Security Factors and Issues.

TOTAL: 45 PERIODS

REFERENCES

1. William Stallings, "Cryptography and Network Security - Principles And Practices", Pearson Education, 3rd Edition, 2003.
2. Atul Kahate, "Cryptography and Network Security", Tata McGraw Hill, 2003.
3. Bruce Schneier, "Applied Cryptography", John Wiley and Sons Inc, 2001.
4. Stewart S. Miller, "Wi-Fi Security", McGraw Hill, 2003.
5. Charles B. Pfleeger, Shari Lawrence Pfleeger, "Security In Computing", 3rd Edition, Pearson Education, 2003.
6. Mai, "Modern Cryptography: Theory and Practice", First Edition, Pearson Education, 2003.

MES009 COMPUTERS IN NETWORKING AND DIGITAL CONTROL

L	T	P	C
3	0	0	3

AIM

To gain knowledge on computers in networking and digital control

OBJECTIVE

- To learn the fundamentals of networking
- To learn the concepts of data communication, encoding and congestion control
- To understand hardware and software simulation of I/O communication blocks and virtual instrumentation.
- To be skilled at measurement and control.

UNIT I NETWORK FUNDAMENTALS 9

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 9

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 9

Block diagram and Architecture - Data flow techniques - Graphical programming using GUI - Real time system - Embedded controller - Instrument drivers - Software and hardware simulation of I/O communication blocks - ADC/DAC - Digital I/O - Counter , Timer, Data communication ports.

UNIT IV MEASUREMENT AND CONTROL THROUGH INTERNET 9

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 9

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

1. Wayne Tomasi, "Introduction to Data communications and Networking" Pearson Education, 2007.
2. Al Williams, "Embedded Internet Design", Second Edition, TMH, 2007.
3. Douglas E.Comer, "Internetworking with TCP/IP, Vol. 1", Third Edition, Prentice Hall, 1999.
4. Cory L. Clark, "LabVIEW Digital Signal Processing and Digital Communication", TMH Edition 2005.
5. Behrouza A Forouzan,"Data Communications and Networking" Fourth edition, TMH, 2007.
6. Krishna Kant,"Computer based Industrial control",PHI,2002.
7. Gary Johnson, "LabVIEW Graphical Programming", Second edition, McGraw Hill, Newyork, 1997.
8. Kevin James, "PC Interfacing and Data Acquisition: Techniques for measurement, Instrumentation and control, Newnes, 2000.
9. Cory L. Clark, "LabVIEW Digital Signal processing and Digital Communications" Tata McGraw-Hill edition, 2005.

MES010 DISTRIBUTED EMBEDDED COMPUTING

L	T	P	C
3	0	0	3

AIM

To impart knowledge on distributed embedded computing and its architecture

OBJECTIVE

- To gain knowledge on hardware infrastructure of distributed system.
- To learn the concepts of internet.
- To study streaming, serialization and networking in JAVA
- To study the design of embedded agent and co-ordination mechanisms
- To learn the architecture of embedded computing and design methodologies.

UNIT I THE HARDWARE INFRASTRUCTURE 9

Broad Band Transmission facilities - Open Interconnection standards - Local Area Networks - Wide Area Networks - Network management - Network Security - Cluster computers.

UNIT II INTERNET CONCEPTS 9

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 9

IO streaming - Object serialization - Networking - Threading - RMI - multicasting - distributed databases - embedded java concepts - case studies.

UNIT IV EMBEDDED AGENT 9

Introduction to the embedded agents - Embedded agent design criteria - Behaviour based, Functionality based embedded agents - Agent co-ordination mechanisms and benchmarks embedded-agent. Case study: Mobile robots.

UNIT V EMBEDDED COMPUTING ARCHITECTURE 9

Synthesis of the information technologies of distributed embedded systems - analog/digital co-design - optimizing functional distribution in complex system design - validation and fast prototyping of multiprocessor system-on-chip - a new dynamic scheduling algorithm for real-time multiprocessor systems.

TOTAL: 45 PERIODS

REFERENCES

1. Dietel & Dietel, "JAVA how to program", Prentice Hall 1999.
2. Sape Mullender, "Distributed Systems", Addison-Wesley, 1993.
3. George Coulouris and Jean Dollimore, "Distributed Systems - concepts and design", Addison -Wesley 1988.
4. Bernd Kleinjohann, "Architecture and Design of Distributed Embedded Systems", C-lab, Universitat Paderborn, Germany, Kluwer Academic Publishers, Boston, April 2001.