ANNA UNIVERSITY OF TECHNOLOGY MADURAI

REGULATIONS - 2010

CURRICULUM & SYLLABI

M.E. EMBEDDED SYSTEMS

SEMESTER I

SL. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	10233PS101	Applied Mathematics for Electrical Engineering	3	1	0	4
2	10233ES102	Advanced Digital System Design	3	0	0	3
3	10233ES103	Micro Controller Based System Design	3	0	0	3
4	10233ES104	Design of Embedded Systems	3	0	0	3
5	10233ES105	Real Time Systems	3	0	0	3
6	E01	Elective I	3	0	0	3
					TOTAL	**19**

SEMESTER II

SL. NO	COURSECODE	COURSE TITLE	L	T	P	C
THEORY						
1	10233ES201	VLSI Architecture and Design Methodologies	3	1	0	4
2	10233ES202	Real Time Operating System	3	0	0	3
3	10233ES203	Embedded Networking	3	1	0	4
4	10233ES204	Wireless and Mobile Communication	3	0	0	3
5	E02	Elective II	3	0	0	3
6	E03	Elective III	3	0	0	3
PRACTICAL						
7	10233ES207	Embedded System Lab	0	0	3	2
					TOTAL	**22**

SEMESTER III

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	E05	Elective IV	3	0	0	3
2	E06	Elective V	3	0	0	3
3	E07	Elective VI	3	0	0	3
PRACTICAL						
4	10233ES304	Project Work (Phase I)	0	0	12	6
					TOTAL	**15**

SEMESTER IV

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
PRACTICAL						
1	10233ES401	Project Work (Phase II)	0	0	24	12
					TOTAL	**12**

TOTAL CREDITS TO BE EARNED FOR THE AWARD THE DEGREE = 68

ELECTIVES FOR M.E EMBEDDED SYSTEMS

SEMESTER I

SL. No	COURSE CODE	COURSE TITLE	L	T	P	C
Elective I - E01						
1	10233ESE11	Software Technology for Embedded Systems	3	0	0	3
2	10233PSE12	Soft Computing Techniques	3	0	0	3
3	10233ESE13	Computer Architecture and parallel processing	3	0	0	3

SEMESTER II

SL. No	COURSE CODE	COURSE TITLE	L	T	P	C
Elective II - E02						
4	10233ESE21	Design of Embedded Control Systems	3	0	0	3
5	10233ESE22	Embedded Communication and Software Design	3	0	0	3
6	10233ESE23	Ad-Hoc Networks	3	0	0	3
Elective III – E03						
7	10233ESE31	Embedded Linux	3	0	0	3
8	10233ESE32	Digital Instrumentation	3	0	0	3
9	10233ESE33	RISC Processor Architecture and Programming	3	0	0	3

SEMESTER III

SL. No	COURSE CODE	COURSE TITLE	L	T	P	C
Elective IV – E04						
10	10233ESE41	Advanced Embedded Systems	3	0	0	3
11	10233PSE32	Advanced Digital Signal Processing	3	0	0	3
12	10233ESE43	Cryptography and Network Security	3	0	0	3
Elective V - E05						
13	10233ESE51	Programming with VHDL	3	0	0	3
14	10233ESE52	Computers in Networking and Digital control	3	0	0	3
15	10233ESE53	Distributed Embedded Computing	3	0	0	3
Elective VI – E06						
16	10233ESE61	Principle of Robotics	3	0	0	3
17	10233PSE63	Application of MEMS Technology	3	0	0	3
18	10233ESE63	Digital Image Processing	3	0	0	3

SEMESTER I

10233PS101 APPLIED MATHEMATICS FOR ELECTRICAL ENGINEERS **L T P C**
3 1 0 4

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. Walpole.R.E, Myers.R.H, Myers.S.L, and K. Ye, Probability and Statistics for Engineers & Scientists, Asia, 8th 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, 2000.

10233ES102 ADVANCED DIGITAL SYSTEM DESIGN **L T P C**
3 0 0 3

UNIT I SEQUENTIAL CIRCUIT DESIGN 9

Analysis of Clocked Synchronous Sequential Networks (CSSN) Modelling of CSSN – State Stable Assignment and Reduction – Design of CSSN – Design of Iterative Circuits – ASM Chart – ASM Realization, Design of Arithmetic circuits for Fast adder- Array Multiplier.

UNIT II ASYNCHRONOUS SEQUENTIAL CIRCUIT DESIGN 9

Analysis of Asynchronous Sequential Circuit (ASC) – Flow Table Reduction – Races in ASC – State Assignment Problem and the Transition Table – Design of ASC – Static and Dynamic Hazards – Essential Hazards – Data Synchronizers – Designing Vending Machine Controller – Mixed Operating Mode Asynchronous Circuits.

UNIT III FAULT DIAGNOSIS AND TESTABILITY ALGORITHMS 9

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 SYNCHRONOUS DESIGN USING PROGRAMMABLE DEVICES 9

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

UNIT V NEW GENERATION PROGRAMMABLE LOGIC DEVICES 9

Foldback Architecture with GAL, EPLD, EPLA , PEEL, PML; PROM – Realization State machine using PLD – FPGA – Xilinx FPGA – Xilinx 2000 - Xilinx 3000

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.

10233ES103 MICROCONTROLLER BASED SYSTEM DESIGN L T P C
3 0 0 3

UNIT I 8051ARCHITECTURE 9

Architecture – memory organization – addressing modes – instruction set – Timers - Interrupts - I/O ports, Interfacing I/O Devices – Serial Communication.

UNIT II 8051 PROGRAMMING 9

Assembly language programming – Arithmetic Instructions – Logical Instructions –Single bit Instructions – Timer Counter Programming – Serial Communication Programming Interrupt Programming – RTOS for 8051 – RTOSLite – FullRTOS –Task creation and run – LCD digital clock/thermometer using FullRTOS

UNIT III PIC MICROCONTROLLER 9

Architecture – memory organization – addressing modes – instruction set – PIC progrmming in Assembly & C –I/O port, Data Conversion, RAM & ROM Allocation, Timer programming, MP-LAB.

UNIT IV PERIPHERAL OF PIC MICROCONTROLLER 9

Timers – Interrupts, I/O ports- I^2C bus-A/D converter-UART- CCP modules -ADC, DAC and Sensor Interfacing –Flash and EEPROM memories.

UNIT V SYSTEM DESIGN – CASE STUDY 9

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

TOTAL : 45 PERIODS

REFERENCES:

1. Muhammad Ali Mazidi, Rolin D. Mckinlay, Danny Causey ‘ PIC Microcontroller and Embedded Systems using Assembly and C for PIC18’, Pearson Education 2008
2. John Iovine, ‘PIC Microcontroller Project Book ’, McGraw Hill 2000
3. Myke Predko, “Programming and customizing the 8051 microcontroller”, Tata McGraw Hill 2001.

10233ES104 DESIGN OF EMBEDDED SYSTEMS

L	T	P	C
3	0	0	3

UNIT I EMBEDDED DESIGN LIFE CYCLE 9

Product specification – Hardware / Software partitioning – Detailed hardware and software design – Integration – Product testing – Selection Processes – Microprocessor Vs Micro Controller – Performance tools – Bench marking – RTOS Micro Controller – Performance tools – Bench marking – RTOS availability – Tool chain availability – Other issues in selection processes.

UNIT II PARTITIONING DECISION 9

Hardware / Software duality – coding Hardware – ASIC revolution – Managing the Risk – Co-verification – execution environment – memory organization – System startup – Hardware manipulation – memory mapped access – speed and code density.

UNIT III INTERRUPT SERVICE ROUTINES 9

Watch dog timers – Flash Memory basic toolset – Host based debugging – Remote debugging – ROM emulators – Logic analyser – Caches – Computer optimisation – Statistical profiling

UNIT IV IN CIRCUIT EMULATORS 9

Buller proof run control – Real time trace – Hardware break points – Overlay memory – Timing constraints – Usage issues – Triggers.

UNIT V TESTING 9

Bug tracking – reduction of risks & costs – Performance – Unit testing – Regression testing – Choosing test cases – Functional tests – Coverage tests – Testing embedded software – Performance testing – Maintenance.

TOTAL : 45 PERIODS

REFERENCES:

1. Arnold S. Berger – “Embedded System Design”, CMP books, USA 2002.
2. Sriram Iyer, “Embedded Real time System Programming”,Tata McGraw Hill, 2003.
3. Arkin. R.C., Behaviour-based Robotics, The MIT Press, 1998.

10233ES105 REAL TIME SYSTEMS **L T P C**
3 0 0 3

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. Krishna.C.M, 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. Allworth.S.T and Zobel.R.N, “Introduction to real time software design”, Macmillan, 2nd Edition, 1987.
6. Buhur.R.J.A, Bailey.D.L, “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.

10233ES201 VLSI ARCHITECTURE AND DESIGN METHODOLOGIES L T P C
3 1 0 4

UNIT I CMOS DESIGN 9

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 12

Programming Techniques-Anti fuse-SRAM-EPROM and EEPROM technology –
Re-Programmable Devices Architecture- Function blocks, I/O blocks,Interconnects, Xilinx-XC9500,Cool Runner - XC-4000,XC5200, SPARTAN, Virtex - Altera MAX 7000-Flex 10K-Stratix.

UNIT III ASIC CONSTRUCTION, FLOOR PLANNING, PLACEMENT AND ROUTING 6

System partition – FPGA partitioning – Partitioning methods- floor planning – placement- physical design flow – global routing – detailed routing – special routing- circuit extraction – DRC.

UNIT IV ANALOG VLSI DESIGN 6

Introduction to analog VLSI- Design of CMOS 2stage-3 stage Op-Amp –High Speed and High frequency op-amps-Super MOS-Analog primitive cells-realization of neural networks.

UNIT V LOGIC SYNTHESIS AND SIMULATION 12

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.

L : 45 T : 15 TOTAL :60 PERIODS

REFERENCES:

1. Smith.M.J.S, “Application Specific integrated circuits”,Addition Wesley Longman Inc.1997.

2.Kamran Eshraghian,Douglas A.pucknell and Sholeh Eshraghian,”Essentials of VLSI circuits and system”, Prentice Hall India,2005.

3. Wayne Wolf, “ Modern VLSI design “ Prentice Hall India,2006.

4. Mohamed Ismail ,Terri Fiez, “Analog VLSI Signal and information Processing”, McGraw Hill International Editions,1994.

5.Samir Palnitkar, “Veri Log HDL, A Design guide to Digital and Synthesis” 2nd Ed,Pearson,2005.

10233ES202 REAL TIME OPERATING SYSTEMS **L T P C**
3 0 0 3

UNIT I REVIEW OF OPERATING SYSTEMS **9**

Basic Principles - Operating System structures – System Calls – Files – Processes – Design and Implementation of processes – Communication between processes –Introduction to Distributed operating system – Distributed scheduling.

UNIT II OVERVIEW OF RTOS **9**

RTOS Task and Task state - Process Synchronisation- Message queues – Mail boxes - pipes – Critical section – Semaphores – Classical synchronisation problem – Deadlocks -

UNIT III REAL TIME MODELS AND LANGUAGES **9**

Event Based – Process Based and Graph based 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. Raj Kamal, “Embedded Systems- Architecture, Programming and Design” Tata McGraw Hill, 2006.
2. Herma K., “Real Time Systems – Design for distributed Embedded Applications”, Kluwer Academic, 1997.

3 Charles Crowley, “Operating Systems-A Design Oriented approach” McGraw Hill 1997.

4 Krishna.C.M, Kang, Shin.G, “Real Time Systems”, McGraw Hill, 1997.

5. Raymond J.A.Bhur, Donald L.Bailey, “An Introduction to Real Time Systems”, PHI 1999.

6. Mukesh Sighal and Shi.N.G “Advanced Concepts in Operating System”, McGraw Hill 2000.

10233ES203 EMBEDDED NETWORKING **L T P C**
3 1 0 4

UNIT I EMBEDDED COMMUNICATION PROTOCOLS 8

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 – Firewire

UNIT II USB AND CAN BUS 10

USB bus – Introduction – Speed Identification on the bus – USB States – USB bus communication: Packets –Data flow types –Enumeration –Descriptors –PIC 18 Microcontroller USB Interface – C Programs –CAN Bus – Introduction - Frames –Bit stuffing –Types of errors –Nominal Bit Timing – PIC microcontroller CAN Interface –A simple application with CAN

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

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

L: 45 T: 15 TOTAL: 60

REFERENCES:

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

10233ES204 WIRELESS AND MOBILE COMMUNICATION **L T P C**
3 0 0 3

UNIT I INTRODUCTION **9**

Wireless Transmission – signal propagation – spread spectrum – Satellite Networks – Capacity Allocation – FAMA – DAMA – MAC

UNIT II MOBILE NETWORKS **9**

Cellular Wireless Networks – GSM – Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Handover – Security – GPRA

UNIT III WIRELESS NETWORKS **9**

Wireless LAN – IEEE 802.11 Standard-Architecture – Services – AdHoc Network- Hiper Lan – Blue Tooth.

UNIT IV ROUTING **9**

Mobile IP – DHCP – AdHoc Networks – Proactive and Reactive Routing Protocols – Multicast Routing

UNIT V TRANSPORT AND APPLICATION LAYERS **9**

TCP over Adhoc Networks – WAP – Architecture – WWW Programming Model – WDP – WTLS – WTP – WSP – WAE – WTA Architecture – WML – WML scripts.

TOTAL : 45 PERIODS

REFERENCES:

1. Kaveh Pahlavan, Prasanth Krishnamoorthy, " Principles of Wireless Networks' PHI/Pearson Education, 2003
2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, " Principles of Mobile computing", Springer, New york, 2003.
3. Toh.C.K, " AdHoc mobile wireless networks", Prentice Hall, Inc, 2002.
4. Charles E. Perkins, " Adhoc Networking", Addison-Wesley, 2001.
5. Jochen Schiller, " Mobile communications", PHI/Pearson Education, Second Edition, 2003.
6. William Stallings, " Wireless communications and Networks", PHI/Pearson Education, 2002.

10233ES207 EMBEDDED SYSTEMS LABORATORY L T P C
0 0 3 2

1. Design with 8 bit Microcontrollers 8051/PIC Microcontrollers
   i) I/O Programming, Timers, Interrupts, Serial port programming
   ii) PWM Generation, Motor Control, ADC/DAC, LCD and RTC Interfacing, Sensor Interfacing
   iii) Both Assembly and C programming
2. Design with 16 bit processors
   I/O programming, Timers, Interrupts, Serial Communication,
3. Design with ARM Processors.
   I/O programming, ADC/DAC, Timers, Interrupts,
4. Study of one type of Real Time Operating Systems (RTOS)
5. Electronic Circuit Design of sequential, combinational digital circuits using CAD Tools
6. Simulation of digital controllers using MATLAB/LabVIEW .
7. Programming with DSP processors for
   Correlation, Convolution, Arithmetic adder, Multiplier, Design of Filters - FIR based , IIR based
8. Design with Programmable Logic Devices using Xilinx/Altera FPGA and CPLD
   Design and Implementation of simple Combinational/Sequential Circuits
9. Network Simulators
   Simple wired/ wireless network simulation using NS2
10. Programming of TCP/IP protocol stack.

TOTAL : 45 PERIODS

REFERENCES:

1. Mohamammad Ali Mazidi & Mazidi, “8051 Microcontroller and Embedded Systems”, Pearson Education
2. Mohammad Ali Mazidi, Rolind Mckinley and Danny Causey, “PIC Microcontroller and Embedded Systems”, Pearson Education
3. Jan Axelson, “Embedded Ethernet and Internet Complete”, Penram publications
4. Kraig Mitzner, “Complete PCB Design using ORCAD Capture and Layout”, Elsevier
5. Woon-Seng Gan, Sen M. Kuo, “Embedded Signal Processing with the Micro Signal Architecture”, John Wiley & Sons, Inc., Hoboken, New Jersey 2007
6. Meyer-Baese.U “Digital Signal Processing using Field Programmable Gate Arrays”, Springer
7. Dogan Ibrahim, “Advanced PIC microcontroller projects in C”, Elsevier 2008

ELECTIVE SUBJECTS FOR I SEMESTER

10233ESE11 SOFTWARE TECHNOLOGY FOR EMBEDDED SYSTEMS L T P C 3 0 0 3

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 – Toper 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. DeitelH.M , P.J.Deitel, A.B. Golldberg “ Internet and World Wide Web – How to Program” Third Edition , Pearson Education , 2001.
4. Bruce Powel Douglas, “Real-Time UML, Second Edition: Developing Efficient Object for Embedded Systems, 2nd edition ,1999, Addison-Wesley
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.

10233PSE12 SOFT COMPUTING TECHNIQUES L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Approaches to intelligent control. Architecture for intelligent control. Symbolic reasoning system, rule-based systems, the AI approach. Knowledge representation. Expert systems.

UNIT II ARTIFICIAL NEURAL NETWORKS 9

Concept of Artificial Neural Networks and its basic mathematical model, McCulloch-Pitts neuron model, simple perceptron, Adaline and Madaline, Feed-forward Multilayer Perceptron. Learning and Training the neural network. Data Processing: Scaling, Fourier transformation, principal-component analysis and wavelet transformations. Hopfield network, Self-organizing network and Recurrent network. Neural Network based controller

UNIT III FUZZY LOGIC SYSTEM 9

Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning. Introduction to fuzzy logic modeling and control. Fuzzification, inferencing and 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 9

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 anD-colony search techniques for solving optimization problems.

UNIT V APPLICATIONS 9

GA application to power system optimisation problem, Case studies: Identification and control of linear and nonlinear dynamic systems using Matlab-Neural Network toolbox.
Stability analysis of Neural-Network interconnection systems. Implementation of fuzzy logic controller using Matlab fuzzy-logic toolbox. Stability analysis of fuzzy control systems.

TOTAL : 45 PERIODS

REFERENCES

1. Jacek.M.Zurada, "Introduction to Artificial Neural Systems", Jaico Publishing House, 1999.
2. Kosko.B. "Neural Networks And Fuzzy Systems", Prentice-Hall of India Pvt. Ltd., 1994.
3. Klir.G.J. & Folger T.A. "Fuzzy sets, uncertainty and Information", Prentice-Hall of India Pvt. Ltd., 1993.
4. Zimmerman H.J. "Fuzzy set theory-and its Applications"-Kluwer Academic Publishers, 1994.
5. Driankov, Hellendroon, "Introduction to Fuzzy Control", Narosa Publishers.

10233ESE13 COMPUTER ARCHITECTURE AND PARALLEL PROCESSING

L	T	P	C
3	0	0	3

UNIT I THEORY OF PARALLELISM 9

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 9

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 TECHNOLGIES 9

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:

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. Carl Homacher, Zvonko Vranesic, Sefwat Zaky, “Computer Organisation”, 5th Edition, TMH, 2002.
4. David E. Culler, Jaswinder Pal Singh with Anoop Gupta “Parallel Computer Architecture” ,Elsevier, 2004.
5. John P. Shen. “Modern processor design Fundamentals of super scalar processors”, Tata McGraw Hill 2003.
6. Sajjan G. Shiva “Advanced Computer Architecture”, Taylor & Francis, 2008.
7. V.Rajaraman, C.Siva Ram Murthy, “Parallel Computers- Architecture and Programming”, Prentice Hall India, 2008.
8. John L. Hennessy, David A. Petterson, “Computer Architecture: A Quantitative Approach”, 4th Edition, Elsevier, 2007.
9. Harry F. Jordan Gita Alaghaband, “Fundamentals of Parallel Processing”. Pearson Education, 2003.Richard Y. Kain, “Advanced computer architecture – A system Design Approach”, PHI, 2003.

ELECTIVE SUBJECTS FOR II SEMESTER

10233ESE21 DESIGN OF EMBEDDED CONTROL SYSTEM L T P C
3 0 0 3

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 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 - 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:

1. Steven F. Barrett, Daniel J. Pack, “Embedded Systems – Design and Applications with the 68HC 12 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. Steven F.Barrett,Daniel J.Pack,”Embedded Systems-Design & Application with the 68HC12 & HCS12”, Pearson Education,2008
6. Daniel W. Lewis, “Fundamentals of Embedded Software”, Prentice Hall India, 2004.
7. Jack R Smith “Programming the PIC microcontroller with MBasic” Elsevier, 2007.
8. Keneth J.Ayala, “The 8086 Microprocessor: Programming & Interfacing the PC”, Thomson India edition, 2007.

10233ESE22 EMBEDDED COMMUNICATION SOFTWARE DESIGN L T P C 3 0 0 3

UNIT I OSI REFERENCE MODEL 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 TABLES & OTHER 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, 2001.

10233ESE23 ADHOC NETWORKS **L T P C**
3 0 0 3

UNIT I WIRELESS LAN, PAN, WAN AND MAN 9

Characteristics of wireless channel, Fundamentals of WLANs, IEEE 802.11 standard, HIPERLAN Standard, First-, Second-, and third- generation cellular systems, WLL, Wireless ATM, IEEE 802.16 standard, HIPERACCESS, AdHoc Wireless Internet.

UNIT II MAC, ROUTING AND MULTICAST ROUTING PROTOCOLS 9

MAC Protocols: Design issues, goals and classification, Contention –based protocols with reservation and scheduling mechanisms, Protocols using directional antennas. Routing protocols: Design issues and classification, Table-driven, On-demand and Hybrid routing protocols, Routing protocols with efficient flooding mechanisms, Hierarchical and power-aware routing protocols. Multicast Routing Protocols: Design issues and operation, Architecture reference model, classification, Tree-based and Mesh-based protocols, Energy-efficient multicasting.

UNIT III TRANSPORT LAYER AND SECURITY PROTOCOLS 9

Transport layer Protocol: Design issues, goals and classification, TCP over AdHoc wireless Networks, Security, Security requirements, Issues and challenges in security provisioning, Network security attacks, Security routing.
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 9

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 9

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. Siva Ram Murthy.C and Manoj.B.S, AdHoc Wireless Networks: Architectures and protocols, Prentice Hall PTR, 2004
2. Toh.C.K, AdHoc Mobile Wireless Networks: Protocols and Systems, Prentice Hall PTR, 2001
3. Mohammad Ilyas, The Handbook of AdHoc Wireless Networks, CRC press, 2002
4. Charles E. Perkins, AdHoc Networking, Addison – Wesley, 2000
5. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan Stojmenovic, Mobile AdHoc Networking, Wiley – IEEE press, 2004.

10233ESE31 **EMBEDDED LINUX** **L T P C**
3 1 0 4

UNIT I FUNDAMENTALS OF OPERATING SYSTEMS 8

Overview of operating systems – Process and threads – Processes and Programs – Programmer view of processes – OS View of processes – Threads - Scheduling – Non preemptive and preemptive scheduling – Real Time Scheduling – Process Synchronization – Semaphores – Message Passing – Mailboxes – Deadlocks – Synchronization and scheduling in multiprocessor Operating Systems

UNIT II LINUX FUNDAMENTALS 10

Introduction to Linux – Basic Linux commands and concepts – Logging in - Shells - Basic text editing - Advanced shells and shell scripting – Linux File System –Linux programming - Processes and threads in Linux - Inter process communication – Devices – Linux System calls

UNIT III 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 IV BOARD SUPPORT PACKAGE AND EMBEDDED STORAGE 10

Inclusion of BSP in kernel build procedure - The bootloader Interface – Memory Map – Interrupt Management – PCI Subsystem – Timers – UART – Power Management – Embedded Storage – Flash Map – Memory Technology Device (MTD) –MTD Architecture - MTD Driver for NOR Flash – The Flash Mapping drivers – MTD Block and character devices – mtdutils package – Embedded File Systems – Optimizing storage space – Turning kernel memory

UNIT V EMBEDDED DRIVERS AND APPLICATION PORTING 9

Linux serial driver – Ethernet driver – I2C subsystem – USB gadgets – Watchdog timer – Kernel Modules – Application porting roadmap - Programming with pthreads – Operting System Porting Layer – Kernel API Driver - Case studies - RT Linux – uClinux

L : 45 T: 15 TOTAL: 60

REFERENCE BOOKS

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
4. Raghavan.P ,Amol Lad , Sriram Neelakandan, ‘Embedded Linux System Design and Development’, Auerbach Publications 2006
5. Karim Yaghmour, ‘Building Embedded Linux Systems’, O'Reilly Publications 2003

10233ESE32 DIGITAL INSTRUMENTATION **L T P C**
3 0 0 3

UNIT I DATA ACQUISITION SYSTEMS 9

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 9

Data transmission systems – 8086 Microprocessor based system design – Peripheral Interfaces – Time Division Multiplexing (TDM) – Digital Modulation – Pulse Modulation – Pulse Code Format – Interface systems and standards – Communications.

UNIT III INSTRUMENTATION BUS 9

Introduction, Modem standards, Basic requirements of Instrument Bus standards, Bus communication, interrupt and data handshaking , Interoperability, interchangeability for RS-232, USB, RS-422, RS-485.

UNIT IV PARALLEL PORT BUSES 9

Field bus, Mod bus, GPIB, IEEE-488, VME, VXI, Network buses – Ethernet – TCP/IP protocols; CAN bus- basics, Message transfer, Fault confinement.

UNIT V CASE STUDIES 9

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:

1. Bouwens.A.J, “Digital Instrumentation” , TATA McGraw-Hill Edition, 1998.
2. Mathivanan.N, “Microprocessors, PC Hardware and Interfacing”, Prentice-Hall India, 2005.
3. Kalsi.H.S., “Electronic Instrumentation” Second Edition, Tata McGraw-Hill,2006.
4. Joseph J. Carr, “Elements of Electronic Instrumentation and Measurement” Third Edition, Pearson Education, 2003.
5. Buchanan, “Computer busses”, Arnold, London,2000.
6. Jonathan W Valvano, “Embedded Microcomputer systems”, Asia Pvt. Ltd., Brooks/Cole, Thomson, 2001.

10233ESE33 RISC PROCESSOR ARCHITECTURE AND PROGRAMMING L T P C
3 0 0 3

UNIT I AVR MICROCONTROLLER ARCHITECTURE 9

Architecture – memory organization – addressing modes – instruction set – programming techniques –Assembly language & C programming- Development Tools – Cross Compilers – Hardware Design Issues .

UNIT II PERIPHERAL OF AVR MICROCONTROLLER 9

I/O Memory – EEPROM – I/O Ports –SRAM –Timer –UART – Interrupt Structure- Serial Communication with PC – ADC/DAC Interfacing .

UNIT III ARM ARCHITECTURE AND PROGRAMMING 9

Arcon RISC Machine – Architectural Inheritance – Core & Architectures -
Registers – Pipeline - Interrupts – ARM organization - ARM processor family – Co-processors. Instruction set – Thumb instruction set – Instruction cycle timings - The ARM Programmer's model – ARM Development tools – ARM Assembly Language Programming and 'C'compiler programming.

UNIT IV ARM APPLICATION DEVELOPMENT 9

Introduction to DSP on ARM –FIR Filter – IIR Filter – Discrete fourier transform – Exception Handling – Interrupts – Interrupt handling schemes- Firmware and bootloader – Example: Standalone - Embedded Operating Systems – Fundamental Components - Example Simple little Operating System

UNIT V DESIGN WITH ARM MICROCONTROLLERS 9

Integrated development environment - STDIO Libraries - User Peripheral Devices – Application of ARM processor: Wireless Sensor Networks, Robotics.

TOTAL : 45 PERIODS

REFERENCES:

1. Steve Furber, 'ARM system on chip architecture', Addision Wesley
2. Andrew N. Sloss, Dominic Symes, Chris Wright, John Rayfield 'ARM System Developer's Guide Designing and Optimizing System Software', Elsevier 2007.
3. Trevor Martin, **'**The Insider's Guide To The Philips ARM7-Based Microcontrollers, An Engineer's Introduction To The LPC2100 Series' Hitex (UK) Ltd.,
4. Dananjay V. Gadre 'Programming and Customizing the AVR microcontroller', McGraw Hill 2001
5. ARM Architecture Reference Manual
6. LPC213x User Manual
7. www.arm.com
8. www.nxp.com

ELECTIVE SUBJECTS FOR III SEMESTER

10233ESE41 ADVANCED EMBEDDED SYSTEMS **L T P C**
3 0 0 3

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-ProcessorArchitectures, 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, “Harware/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.

10233PSE32 ADVANCED DIGITAL SIGNAL PROCESSING **L T P C**
3 0 0 3

UNIT I INTRODUCTION **9**

Mathematical description of change of sampling rate – Interpolation and Decimation, Filter implementation for sampling rate conversion – direct form FIR structures, DTFT, FFT, Wavelet transform and filter bank implementation of wavelet expansion of signals

UNIT II ESTIMATION AND PREDICTION TECHNIQUES **9**

Discrete Random Processes – Ensemble averages, Stationary processes, Autocorrelation and Auto covariance matrices. Parseval's Theorem, Wiener-Khintchine Relation – Power Spectral Density**.** AR, MA, ARMA model based spectral estimation. Parameter Estimation, Linear prediction – Forward and backward predictions, Least mean squared error criterion – Wiener filter for filtering and prediction, Discrete Kalman filter.

UNIT III DIGITAL SIGNAL PROCESSOR **9**

Basic Architecture – Computational building blocks, MAC, Bus Architecture and memory, Data Addressing, Parallelism and pipelining, Parallel I/O interface, Memory Interface, Interrupt, DMA.

UNIT IV APPLICATION OF DSP **9**

Design of Decimation and Interpolation Filter, FFT Algorithm, PID Controller, Application for Serial Interfacing, DSP based Power Meter, Position control.

UNIT V VLSI IMPLEMENTATION **9**

Basics on DSP sytem architecture design using VHDL programming, Mapping of DSP algorithm onto hardware, Realisation of MAC & Filter structure.

TOTAL : 45 PERIODS

REFERENCES:

1. Bernard Widrow, Samuel D. Stearns, "Adaptive Signal Processing", Pearson Education, third edition, 2004.
2. Dionitris G. Manolakis, Vinay K. Ingle, Stepen M. Kogon,"Statistical & Adaptive signal processing, spectral estimation, signal modeling, Adaptive filtering & Array processing", McGraw-Hill International edition 2000.
3. Monson H. Hayes, "Statistical Digital Signal Processing and Modelling", John Wiley and Sons, Inc.,
4. John G. Proaks, Dimitris G. Manolakis, "Digital Signal Processing", Pearson Education 2002.
5. S. Salivahanan, A. Vallavaraj and C. Gnanapriya "Digital Signal Processing", TMH,2000.
6. Avatar Sing, S. Srinivasan, "Digital Signal Processing- Implementation using DSP Microprocessors with Examples from TMS320C54xx", Thomson India, 2004.
7. Lars Wanhammer, "DSP Integrated Circuits", Academic press, 1999,New York.
8. Ashok Ambardar,"Digital Signal Processing: A Modern Introduction",Thomson India edition, 2007.
9. Lars Wanhammer, "DSP Integrated Circuits", Academic press, 1999,New York.

10233ESE43 CRYPTOGRAPHY AND NETWORK SECURITY L T P C
3 0 0 3

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

TEXT BOOKS

1. William Stallings, “Cryptography And Network Security – Principles And Practices”, Pearson Education, 3rd Edition, 2003.

REFERENCES

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

10233ESE51 PROGRAMMING WITH VHDL

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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

Procedures-Procedure parameters- Concurrent procedure call statements –Functions – Overloading –visibility of Declarations-packages and use clauses- Package declarations-package bodies-use clauses-Predefined aliases-Aliases for Data objects-Aliases for Non-Data items-Files- I/O-Files. Case study: A bit vector arithmetic Package.

UNIT IV SIGNALS, COMPONENTS, CONFIGURATIONS. 9

Basic Resolved Signals-IEEE std_Logic_1164 resolved subtypes- resolved Signal Parameters - Generic Constants- Parameterizing behavior- Parameterizing structure-components and configurations-Generate Statements-Generating Iterative structure-Conditionally generating structure-Configuration of generate statements-case study: DLX computer Systems.

UNIT V DESIGN WITH PROGRAMMABLE LOGIC DEVICES 9

Realization of -Micro controller CPU.- Memories- I/O devices-MAC-Design,synthesis,simulation and testing.

TOTAL : 45 PERIODS

REFERENCES:

1. Peter J.Ashenden, “The Designer’s guide to VHDL”, Morgan Kaufmann publishers,San Francisco,Second Edition, May 2001.
2. Zainalabedin navabi, “VHDL Analysis ans modeling of Digital Systems”, McGraw Hill international Editions, Second Editions, 1998.
3. Charles H Roth, Jr. “Digital system Design using VHDL”, Thomson ,2006.
4. Douglas Perry, “VHDL Programming by Example”, Tata McGraw Hill,4th Edition 2002.
5. Navabi.Z., “VHDL Analysis and Modeling of Digital Systems”, McGraw International, 1998.
6. Peter J Ashendem, “The Designers Guide to VHDL”, Harcourt India Pvt Ltd, 2002
7. Skahill. K, “VHDL for Programmable Logic”, Pearson education, 1996.

10233ESE52 COMPUTERS IN NETWORKING AND DIGITAL CONTROL

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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.

10233ESE53 EMBEDDED COMPUTING

L T P C
3 0 0 3

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. “Architecture and Design of Distributed Embedded Systems”, edited by Bernd Kleinjohann C-lab, Universitat Paderborn, Germany, Kluwer Academic Publishers, Boston, April 2001, 248 pp.

10233ESE61 PRINCIPLES OF ROBOTICS L T P C
3 0 0 3

UNIT I INTRODUCTION AND TERMINOLOGIES 9

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-social issues

UNIT II KINEMATICS 9

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

UNIT III DIFFERENTIAL MOTION & VELOCITIES 9

Jacobian-differential motion of frames-Interpretation-calculation of Jacobian-Inverse Jacobian-Design-Lagrangian mechanics-dynamic equations-static force analysis

UNIT IV ROBOT CONTROL SYSTEM 9

Sensor characteristics- Hydraulic, Pneumatic and electric actuators-trajectory planning-decentalised PID control- non-linear decoupling control

UNIT V IMAGE PROCESSING & VISION SYSTEMS 9

Two and three dimensional images-spatial and frequency domain representation-noise and edges- convolution masks-Processing techniques-thersholding-noise reduction-edge detection-segmentation-Image analysis and object recognition

TOTAL : 45 PERIODS

REFERENCES

1. Saeed B. Niku ,''Introduction to Robotics '', Pearson Education, 2002
2. Fu, Gonzalez and Lee Mcgrahill ,''Robotics '', international
3. R.D. Klafter, TA Chmielewski and Michael Negin, ''Robotic Engineering, An Integrated approach'', Prentice Hall of India, 2003.

10233PSE63 APPLICATIONS OF MEMS TECHNOLOGY **L T P C**
3 0 0 3

UNIT I MEMS:MICRO-FABRICATION, MATERIALS AND ELECTRO-MECHANICAL CONCEPTS **9**

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 **9**

Principle, material, design and fabrication of parallel plate capacitors as electrostatic sensors and actuators-Applications

UNIT III THERMAL SENSING AND ACTUATION **9**

Principle, material, design and fabrication of thermal couples, thermal bimorph sensors, thermal resistor sensors-Applications.

UNIT IV PIEZOELECTRIC SENSING AND ACTUATION **9**

Piezoelectric effect-cantilever piezo electric actuator model-properties of piezoelectric materials-Applications.

UNIT V CASE STUDIES **9**

Piezoresistive sensors, Magnetic actuation, Micro fluidics applications, Medical applications, Optical MEMS.

TOTAL : 45 PERIODS

REFERENCES

1. Chang Liu, “Foundations of MEMS”, Pearson International Edition, 2006.

2. Marc Madou , “Fundamentals of microfabrication”,CRC Press, 1997.

3.Boston , “Micromachined Transducers Sourcebook”,WCB McGraw Hill, 1998.

4.M.H.Bao “Micromechanical transducers :Pressure sensors, accelerometers and gyroscopes”, Elsevier, Newyork, 2000.

10233ESE63 DIGITAL IMAGE PROCESSING L T P C
3 0 0 3

UNIT I FUNDAMENTALS OF IMAGE PROCESSING 9

Introduction – Steps in image processing systems – Image acquisition – Sampling and Quantization – Pixel relationships – Color fundamentals and models, File formats, Image operations – Arithmetic, Geometric and Morphological.

UNIT II IMAGE ENHANCEMENT 9

Spatial Domain: Gray level Transformations – Histogram processing – Spatial filtering smoothing and sharpening. Frequency Domain: Filtering in frequency domain – DFT, FFT, DCT – Smoothing and sharpening filters – Homomorphic Filtering.

UNIT III IMAGE SEGMENTATION AND FEATURE ANALYSIS 9

Detection of Discontinuities – Edge operators – Edge linking and Boundary Detection – Thresholding – Region based segmentation – Morphological Watersheds – Motion Segmentation, Feature Analysis and Extraction.

UNIT IV MULTI RESOLUTION ANALYSIS AND COMPRESSIONS 9

Multi Resolution Analysis: Image Pyramids – Multi resolution expansion – Wavelet Transforms, Image compression: Fundamentals – Models – Elements of Information Theory – Error free compression – Lossy Compression – Compression Standards.

UNIT V APPLICATION OF IMAGE PROCESSING 9

Image classification – Image recognition – Image understanding – Video motion analysis – Image fusion – Steganography – Digital compositing Mosaics – Colour Image Processing.

TOTAL : 45 PERIODS

REFERENCES :

1. Rafael C.Gonzalez and Richard E.Woods, “Digital Image Processing”, 2nd Edition, Pearson Education, 2003.
2. Milan Sonka, Valclav Halavac and Roger Boyle, “Image Processing, Analysis and Machine Vision”, 2nd Edition, Thomson Learning, 2001.
3. Anil K.Jain, “Fundamentals of Digital Image Processing”. Pearson Education, 2003.