

w.e.f 2009-2010

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA  
KAKINADA 533 003**

**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING  
M. Tech- I Semester**

**Specialization: DSCE**

**COURSE STRUCTURE**

<b>Code</b>	<b>Name of the Subject</b>	<b>L</b>	<b>P</b>	<b>C</b>	<b>INT</b>	<b>EXT</b>	<b>TOTAL</b>
<b>Core</b>							
	1. Digital System Design	4	-	8	40	60	100
	2. VLSI Technology & Design	4	-	8	40	60	100
	3. Advanced Operating Systems	4	-	8	40	60	100
	4. Advanced Computer Architecture	4	-	8	40	60	100
<b>Elective I</b>							
	1. Digital Data Communications	4	-	8	40	60	100
	2. Neural Networks & Fuzzy Systems						
<b>Elective II</b>							
	1. Embedded & Real Time Systems	4	-	8	40	60	100
	2. Network Security and Cryptography						
<b>Laboratory</b>							
	1. HDL Programming Laboratory	-	4	4	40	60	100

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**M. Tech- I Semester**

**DIGITAL SYSTEM DESIGN**

**UNIT – I**

DESIGN OF DIGITAL SYSTEMS: ASM charts, Hardware description language and control sequence method, Reduction of state tables, state assignments.

**UNIT – II**

SEQUENTIAL CIRCUIT DESIGN: design of Iterative circuits, design of sequential circuits using ROMs and PLAs, sequential circuit design using CPLD, FPGAs.

**UNIT – III**

FAULT MODELING: Fault classes and models – Stuck at faults, bridging faults, transition and intermittent faults. TEST GENERATION: Fault diagnosis of Combinational circuits by conventional methods – Path Sensitization technique, Boolean difference method, Kohavi algorithm.

**UNIT – IV**

TEST PATTERN GENERATION: D – algorithm, PODEM, Random testing, transition count testing, Signature analysis and testing for bridging faults.

**UNIT – V**

FAULT DIAGNOSIS IN SEQUENTIAL CIRCUITS: State identification and fault detection experiment. Machine identification, Design of fault detection experiment.

**UNIT – VI**

PROGRAMMING LOGIC ARRAYS: Design using PLA's, PLA minimization and PLA folding.

**UNIT – VII**

PLA TESTING: Fault models, Test generation and Testable PLA design.

**UNIT – VIII**

ASYNCHRONOUS SEQUENTIAL MACHINE: fundamental mode model, flow table, state reduction, minimal closed covers, races, cycles and hazards.

**TEXT BOOKS:**

1. Z. Kohavi – “Switching & finite Automata Theory” (TMH)
2. N. N. Biswas – “Logic Design Theory” (PHI)

3. Nolman Balabanian, Bradley Calson – “Digital Logic Design Principles” – Wily Student Edition 2004.

**REFERENCE BOOKS:**

1. M. Abramovici, M. A. Breues, A. D. Friedman – “Digital System Testing and Testable Design”,  
Jaico Publications
2. Charles H. Roth Jr. – “Fundamentals of Logic Design”.
3. Frederick. J. Hill & Peterson – “Computer Aided Logic Design” – Wiley 4th Edition. 4

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M. Tech- I Semester**

**VLSI TECHNOLOGY & DESIGN**

**UNIT – I**

REVIEW OF MICROELECTRONICS AND INTRODUCTION TO MOS TECHNOLOGIES: (MOS, CMOS, Bi CMOS) Technology trends and projections.

**UNIT – II**

BASIC ELECTRICAL PROPERTIES OF MOS, CMOS & BICOMS CIRCUITS:  $I_{ds}$ - $V_{ds}$  relationships, Threshold voltage  $V_t$ ,  $G_m$ ,  $G_{ds}$  and  $W_o$ , Pass Transistor, MOS, CMOS & Bi CMOS Inverters,  $Z_{pu}/Z_{pd}$ , MOS Transistor circuit model, Latch-up in CMOS circuits.

**UNIT – III**

LAYOUT DESIGN AND TOOLS: Transistor structures, Wires and Vias , Scalable Design rules ,Layout Design tools.

**UNIT – IV**

LOGIC GATES & LAYOUTS: Static complementary gates, switch logic, Alternative gate circuits, low power gates, Resistive and Inductive interconnect delays.

**UNIT – V**

COMBINATIONAL LOGIC NETWORKS: Layouts, Simulation, Network delay, interconnect design, power optimization, Switch logic networks, Gate and Network testing.

**UNIT – VI**

SEQUENTIAL SYSTEMS: Memory cells and Arrays, clocking disciplines, Design ,power optimization, Design validation and testing.

## **UNIT – VII**

**FLOOR PLANNING & ARCHITECTURE DESIGN:** Floor planning methods, off-chip connections, High-level synthesis, Architecture for low power, SOCs and Embedded CPUs, Architecture testing.

## **UNIT – VIII**

**INTRODUCTION TO CAD SYSTEMS (ALGORITHMS) AND CHIP DESIGN:** Layout Synthesis and Analysis, Scheduling and printing; Hardware/Software Co-design, chip design methodologies- A simple Design example-

### **TEXT BOOKS:**

1. Essentials of VLSI Circuits and Systems, K. Eshraghian et . al( 3 authors) PHI of India Ltd.,2005
2. Modern VLSI Design, 3rd Edition, Wayne Wolf ,Pearson Education, fifth Indian Reprint, 2005.

### **REFERENCES:**

1. Principals of CMOS Design – N.H.E Weste, K.Eshraghian, Adison Wesley, 2nd Edition.
2. Introduction to VLSI Design – Fabricius, MGH International Edition, 1990.
3. CMOS Circuit Design, Layout and Simulation – Baker, Li Boyce, PHI, 2004. 3

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**M. Tech- I Semester**

## **ADVANCED OPERATING SYSTEMS**

### **UNIT I**

Introduction to Operating Systems, Type of operating systems.

### **UNIT II**

**UNIX –I** Overview of UNIX system, Structure, file systems, type of file, ordinary & Special files, file permissions, Introduction to shell.

### **UNIT III**

**UNIX – II** UNIX basic commands & command arguments, Standard input / output Input / output redirection, filters and editors.

### **UNIT IV**

**UNIX SYSTEMS CALLS**

System calls related file structures, input / output process creation & termination.

## **UNIT V**

### **INTERPROCESS COMMUNICATION IN UNIX**

Introduction, file and record locking, Client – Server example, pipes, FIFOs, Streams & Messages, Name Spaces, Systems V IPC, Message queues, Semaphores, Shared Memory, Sockets & TLI.

## **UNIT VI**

### **INTRODUCTION TO NETWORKS AND NETWORK PROGRAMMING IN UNIX :**

Network Primer, TCP/IP – Internet Protocols, Socket Programming – Introduction & overview, UNIX domain protocols, Socket Addresses, Elementary Socket system calls, Simple examples.

## **UNIT VII**

LINUX Introduction to LINUX System, editors and utilities, type of shells.

## **UNIT VIII**

LINUX OPERATIONS Shell operations, file structure, file management, Operations.

## **TEXT BOOKS**

1. The design of the UNIX Operating Systems – Maurice J. Bach (PHI)
2. The UNIX Programming Environment (PHI) – Kernighan & Pike.
3. UNIX Network Programming - W. Richard Stevens (PHI) – 1998.
4. The Complete reference LINUX – Richard Peterson (TMH)
5. UNIX User Guide – Ritchie & Yates.

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#### **M. Tech- I Semester**

## **ADVANCED COMPUTER ARCHITECTURE**

### **UNIT I**

Fundamentals of Computer design- Technology trends- cost- measuring and reporting performance quantitative principles of computer design.

### **UNIT II**

Instruction set principles and examples- classifying instruction set- memory addressing- type and size of operands- addressing modes for signal processing-operations in the instruction set- instructions for control flow- encoding an instruction set.-the role of compiler.

### **UNIT III**

Instruction level parallelism (ILP)- overcoming data hazards- reducing branch costs –high performance instruction delivery- hardware based speculation- limitation of ILP.

#### **UNIT IV**

ILP software approach- compiler techniques- static branch protection- VLIW approach- H.W support for more ILP at compile time- H.W verses S.W solutions.

#### **UNIT V**

Memory hierarchy design- cache performance- reducing cache misses penalty and miss rate – virtual memory- protection and examples of VM.

#### **UNIT VI**

Multiprocessors and thread level parallelism- symmetric shared memory architectures- distributed shared memory- Synchronization- multi threading.

#### **UNIT VII**

Storage systems- Types – Buses - RAID- errors and failures- bench marking a storage device- designing a I/O system.

#### **UNIT VIII**

Inter connection networks and clusters- interconnection network media – practical issues in interconnecting networks- examples – clusters- designing a cluster

#### **TEXT BOOKS**

1. Computer Architecture A quantitative approach 3rd edition John L. Hennessy & David A. Patterson Morgan Kufmann (An Imprint of Elsevier)

#### **REFERENCES**

1. Computer Architecture and parallel Processing - Kai Hwang and A.Briggs International Edition McGraw-Hill.
2. Advanced Computer Architectures, Dezso Sima, Terence Fountain, Peter Kacsuk, Pearson.

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**M. Tech- I Semester**

### **DIGITAL DATA COMMUNICATIONS (Elective-I)**

#### **UNIT I DIGITAL MODULATION TECHNIQUES**

FSK , MSK , BPSK , QPSK , 8-PSK , 16-PSK , 8- QAM , 16- QAM , Band width efficiency carrier recovery DPSK , clock recovery , Probability of error and bit error rate.

#### **UNIT II**

Data Communications ; Serial , Parallel configuration , Topology , Transmission modes , codes , Error Control Synchronization, LCU.

### **UNIT III**

Serial and Parallel Interfaces , Telephone Networks and Circuits , Data modems

### **UNIT IV**

Data Communication Protocols , Character and block Mode ,Asynchronous and Synchronous Protocols, public Data Networks , ISDN.

### **UNIT V**

LOCAL AREA NETWORKS: token ring, Ethernet, Traditional, Fast and GIGA bit Ethernet, FDDI

### **UNIT VI**

DIGITAL MULTIPLEXING : TDM , T1 carrier , CCITT , CODECS, COMBO CHIPS , North American Hierarchy , Line Encoding , T-carrier , Frame Synchronization Inter Leaving Statistical TDM FDM , Hierarchy ,Wave Division Multiplexing .

### **UNIT VII**

WIRELESS LANS

IEEE 802.11 Architecture Layers, Addressing, Blue Tooth Architecture Layers, l2 Cap, Other Upper Layers .

### **UNIT VIII**

MULTI MEDIA

Digitalizing Video and Audio Compression Streaming Stored and Live Video and Audio , Real Time Interactive Video and Audio , VOIP

### **TEXT BOOKS**

1. Electronic communication systems, fundamentals through advanced - W. TOMASI, Pearson 4th Edition.
2. Data communication and networking - B.A. Forouzen

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**M. Tech- I Semester**

**NEURAL NETWORKS & FUZZY SYSTEMS ( Elective –I )**

**Unit-I** Introduction to Neural Networks

Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate-and-Fire Neuron Model, Spiking Neuron Model, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN.

## **Unit-II** Essentials of Artificial Neural Networks

Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN-Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application.

## **Unit-III** Feed Forward Neural Networks

Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Perceptron Convergence theorem, Limitations of the Perceptron Model, Applications.

### Multilayer Feed Forward Neural Networks

Credit Assignment Problem, Generalized Delta Rule, Derivation of Backpropagation (BP) Training, Summary of Backpropagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements.

## **Unit-IV** Associative Memories

Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory (Associative Matrix, Association Rules, Hamming Distance, The Linear Associator, Matrix Memories, Content Addressable Memory), Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function, Proof of BAM Stability Theorem.

Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis, Capacity of the Hopfield Network.

## **Unit-V** Self-Organizing Maps (SOM) and Adaptive Resonance Theory (ART)

Introduction, Competitive Learning, Vector Quantization, Self-Organized Learning Networks, Kohonen Networks, Training Algorithms, Linear Vector Quantization, Stability- Plasticity Dilemma, Feed forward competition, Feedback Competition, Instar, Outstar, ART1, ART2, Applications.

## **Unit-VI** Classical & Fuzzy Sets

Introduction to classical sets – properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, Properties, fuzzy relations, cardinalities, membership functions.

## **Unit-VII** Fuzzy Logic System Components

Fuzzification, Membership Value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

## **Unit-VIII** Applications

Neural network applications: Process identification, Fraction Approximation, Control and Process Monitoring, Fault diagnosis and Load forecasting.

**Fuzzy logic applications:** Fuzzy logic control and Fuzzy classification.

**TEXT BOOK:**

1. Neural Networks, Fuzzy logic , Genetic algorithms: synthesis and applications by Rajasekharan and Rai- PHI Publication.
2. Introduction to Artificial Neural Systems- Jacek M.Zurada, Jaico Publishing House, 1997.

**REFERENCE BOOKS:**

1. Neural and Fuzzy Systems: Foundation, Architectures and Applications, - N. Yadaiah and S. Bapi Raju, Pearson Education
2. Neural Networks – James A Freeman and Davis Skapura, Pearson, 2002
3. Neural Networks – Simon Hykins, Pearson Education.
4. Neural Engineering by C. Eliasmith and CH. Anderson, PHI.  
Neural Networks and Fuzzy Logic System by Brok Kosko, PHI Publications

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**M. Tech- I Semester**

**EMBEDDED AND REAL TIME SYSTEMS (Elective –II )**

**UNIT I: INTRODUCTION**

Embedded systems overview, design challenges, processor technology, Design technology, Trade-offs. Single purpose processors RT-level combinational logic, sequential logic(RT-level), custom purpose processor design(RT -level), optimizing custom single purpose processors.

**UNIT II: GENERAL PURPOSE PROCESSORS**

Basic architecture, operations, programmer's view, development environment, Application specific Instruction –Set processors (ASIPs)-Micro controllers and Digital signal processors.

**UNIT III: STATE MACHINE AND CONCURRENT PROCESS MODELS**

Introduction, models Vs Languages, finite state machines with data path model(FSMD),using state machines, program state machine model(PSM, concurrent process model, concurrent processes, communication among processes, synchronization among processes, Implementation, data flow model, real-time systems.

**UNIT IV: COMMUNICATION PROCESSES**

Need for communication interfaces, RS232/UART, RS422/RS485,USB, Infrared, IEEE1394 Firewire, Ethernet, IEEE 802.11, Blue tooth.

## **UNIT V: EMBEDDED/RTOS CONCEPTS-I**

Architecture of the Kernel, Tasks and task scheduler, interrupt service routines, Semaphores, Mutex.

## **UNIT VI: EMBEDDED/RTOS CONCEPTS-II**

Mailboxes, Message Queues, Event Registers, Pipes-Signals.

## **UNIT VII: EMBEDDED/RTOS CONCEPTS-III**

Timers-Memory Management-Priority inversion problem-embedded operating systems-Embedded Linux-Real-time operating systems-RT Linux-Handheld operating systems-Windows CE.

## **UNIT VIII: DESIGN TECHNOLOGY**

Introduction, Automation, Synthesis, parallel evolution of compilation and synthesis, Logic synthesis, RT synthesis, Behavioral Synthesis, Systems Synthesis and Hardware/Software Co-Design, Verification, Hardware/Software co-simulation, Reuse of intellectual property codes.

## **TEXT BOOKS**

- 1.Embedded System Design-A Unified Hardware/Software Introduction- Frank Vahid, Tony D.Givargis, John Wiley & Sons, Inc.2002.
2. Embedded/Real Time Systems- KVKK prased, Dreamtech press-2005.
3. Introduction to Embedded Systems - Raj Kamal, TMS-2002.

## **REFERENCE BOOKS**

1. Embedded Microcomputer Systems-Jonathan W.Valvano, Books/Cole,Thomson Learning.
2. An Embedded Software Primer- David E.Simon, pearson Ed.2005

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**NETWORK SECURITY AND CRYPTOGRAPHY**  
**( ELECTIVE II )**

### **UNIT I**

**INTRODUCTION:** Attacks, Services and Mechanisms, Security attacks, Security services, A Model for Internetwork security. **CLASSICAL TECHNIQUES:** Conventional Encryption model, Steganography, Classical Encryption Techniques.

## **UNIT II**

**MODERN TECHNIQUES:** Symplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operations. **ALGORITHMS:** Triple DES, International Data Encryption algorithm, Blowfish, RC5, CAST-128, RC2, Characteristics of Advanced Symmetric block cifers.

## **UNIT II**

**CONVENTIONAL ENCRYPTION:** Placement of Encryption function, Traffic confidentiality, Key distribution, Random Number Generation. **PUBLIC KEY CRYPTOGRAPHY:** Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptograpy.

## **UNIT IV**

**NUMBER THEORY:** Prime and Relatively prime numbers, Modular arithmetic, Fermat's and Euler's theorems, Testing for primality, Euclid's Algorithm, the Chinese remainder theorem, Discrete logarithms. **MESSAGE UTHENTICATION AND HASH FUNCTIONS:** Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs.

## **UNIT V**

**HASH AND MAC ALGORITHMS:** MD File, Message digest Algorithm, Secure Hash Algorithm, RIPEMD-160, HMAC. **DIGITAL SIGNATURES AND AUTHENTICATION PROTOCOLS:** Digital signatures, Authentication Protocols, Digital signature standards.

## **UNIT VI**

**AUTHENTICATION APPLICATIONS:** Kerberos, X.509 directory Authentication service. **ELECTRONIC MAIL SECURITY:** Pretty Good Privacy, S/MIME.

## **UNIT VII**

**IP SECURITY:** Overview, Architecture, Authentication, Encapsulating Security Payload, Combining security Associations, Key Management. **WEB SECURITY:** Web Security requirements, Secure sockets layer and Transport layer security, Secure Electronic Transaction.

## **UNIT VIII**

**INTRUDERS, VIRUSES AND WORMS:** Intruders, Viruses and Related threats. **FIRE WALLS:** Fire wall Design Principles, Trusted systems.

## **TEXT BOOKS**

1. Cryptography and Network Security: Principles and Practice - William Stallings, Pearson Education., 2000.

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**HDL PROGRAMMING LABORATORY**

1. Digital Circuits Description using Verilog and VHDL
2. Verification of the Functionality of Designed circuits using function Simulator.
3. Timing simulation for critical path time calculation.
4. Synthesis of Digital circuits
5. Place and Route techniques for major FPGA vendors such as Xilinx, Altera and Actel etc.
6. Implementation of Designed Digital Circuits using FPGA and CPLD devices.