

<b>BHARATHIAR UNIVERSITY</b> <b>M. Sc. APPLIED ELECTRONICS WITH SPECIALIZATION IN VLSI SYSTEM</b> <b>DESIGN DEGREE COURSE WITH COMPULSORY</b> <b>DIPLOMA IN INFORMATION TECHNOLOGY</b> <u><b>Scheme of Examination (I year only)</b></u> <b>For candidates admitted during the Academic Year 2008-2009 and onwards</b>							
SEM	Subject and Paper	Instruction Hrs/ week	Exam duration Hrs	Exam			Credit
				CIA	Uni. Exam	Total	
I	Paper I : Power Control Systems	5	3	25	75	100	5
	Paper II : 8051 Micro Controller and its Applications	5	3	25	75	100	5
	Paper III: Basic VLSI Design	5	3	25	75	100	5
	Paper IV : Digital System Design using VHDL	4	3	25	75	100	5
	Prac I : General Electronics Lab and 8051 Micro Controller Lab	4					
	Prac II : VLSI Lab I	4					
	Diploma I Web Technologies	3	3	25	75	100	3
II	Paper V : Data Communication Networks	5	3	25	75	100	5
	Paper VI : PC Based System Design	5	3	25	75	100	5
	Paper VII: CMOS VLSI Design	5	3	25	75	100	5
	Paper VIII : ASIC Design	4	3	25	75	100	5
	Prac I : General Electronics Lab and 8051 Micro Controller Lab	4	4	40	60	100	4
	Prac II : VLSI Lab I	4	4	40	60	100	4
	Diploma :II Relational Data Base Management Systems	3	3	25	75	100	3

## **SEMESTER – I**

### **PAPER I: POWER CONTROL SYSTEMS**

#### **UNIT I: COMMUTATION**

Review of operations of SCR, UJT and TRIAC –Thyristor commutation techniques: Introduction –Natural commutation –Forced commutation –Self commutation –Impulse commutation –Response pulse commutation –External pulse commutation – Load side and Line side commutation –Complementary commutation.

#### **UNIT II: SWITCHES, CONNECTORS & REGULATORS**

Static Switches: Introduction –Single phase and three phases AC switches –Three phase reversing switches –DC switches –Solid state relays.

AC voltage controller: Introduction –Principle of ON/OFF control –Principle of phase control –Cycloconverter

Switch mode regulators: Buck regulators –Boost regulators –Buck/Boost regulators – CUK regulation –SMPS.

#### **UNIT III: CHOPPERS AND INVERTERS**

DC Choppers: Introduction –Principle of step down operation –Step down with RL load – Principle of step up operation.

Inverters: Introduction –Principle of operations –Single phase bridge invertors –Three phase invertors.

#### **UNIT IV: CONTROL SYSTEM AND FEEDBACK CHARACTERISTICS**

Open loop and closed loop system –Effect of feedback on Gain, Stability, Sensitivity and Noise –Transfer functions –Block diagram –Block diagram reduction –Signal flow graph – Mason's gain formula –Sensitivity control system to parameter variations.

#### **UNIT V: TIME DOMAIN PERFORMANCE**

Zero order, First order and second order systems –Step and Ramp response –Steady state error –Stability of linear time invariant system –Necessary conditions for stability –Hurwitz Criteria –Routh stability criterion.

#### **BOOKS FOR STUDY:**

1. Muhammad Rashid, Power Electronics Circuits, Devices and Applications”, PHI II Edition, 1999 ISBN-81-203-0869-7[Unit I, II & III]
2. KATSUHIKO OGATA Modern Control Engineering – Eastern Economy Edition-3<sup>rd</sup> Edition-1998 ISBN-81-203-0869-6[Unit IV & V]
3. Sen.,“Power Electronics”,McGraw Hill International,ISBN-0-07-462400 -8

## **SEMESTER I**

### **PAPER II: 8051 MICRO CONTROLLER AND ITS APPLICATIONS**

#### **UNIT I: MICROPROCESSOR AND MICROCONTROLLER**

Introduction –Microprocessor and Microcontrollers – Microcontroller Survey –The 8051 Architecture –8051 Microcontroller hardware –Input/Output pins, Ports and Circuits –External memory –Counters and Timers –Serial Data input/Output Interrupts

#### **UNIT II: INSTRUCTION SET**

Addressing Modes –Data Transfer Instruction –Logical Instruction –Arithmetic Instructions –Jump and Call Instructions.

#### **UNIT III: MICROCONTROLLER DESIGN**

Microcontroller Design: External memory and memory spacing decoding –Reset and Clock circuits –Expanding I/O –Memory mapped I/O –Memory access time.

Testing the Design: Crystal test –ROM test and RAM test –Timing Subroutines –Lookup tables for the 8051.

#### **UNIT IV: SERIAL COMMUNICATION AND INTERRUPT PROGRAMMING**

Serial Communication: Basic serial communication –8051 Connection to RS232 – 8051 Serial Communication Programming.

Interrupt Programming: 8051 Interrupts –Programming Timer Interrupts –Programming Hardware External Interrupts –Programming the Serial Communication Interrupt –Interrupt Priority in the 8051.

#### **UNIT V: APPLICATIONS**

Introduction –Keyboards –Displays –Pulse Measurements –D/A and A/D Conversion – Multiple Interrupts.

#### **BOOKS FOR STUDY:**

1. Kenneth J.Ayala “The 8051 Microcontroller Architecture, Programming and Application”, Second Edition, Penram International.[Unit I, II, III, IV & V]
2. Muhammad Ali Mazidi, Janice Gillispie Mazidi “The 8051 Microcontroller and Embedded Systems”, TMH, Low Price Edition.

## **SEMESTER I**

### **PAPER III: BASIC VLSI DESIGN**

#### **UNIT -1: MOS AND BI-CMOS CIRCUIT DESIGN PROCESSES**

MOS Layers –Stick Diagrams –Design Rules and Layout –General Observations on the Design Rules –2 $\mu$ m Double Metal, Double Poly. CMOS/Bicmos Rules –1.2 $\mu$ m Single Metal, Single Poly. CMOS Rules –Layout Diagrams –A Brief Introduction –Symbolic Diagrams – Translation to Mask Form.

#### **UNIT-2: BASIC CIRCUIT CONCEPTS**

Sheet resistance ( $R_s$ ) –Sheet resistance concept applied to MOS transistors and inverters –Area capacitances of layers –Standard unit of capacitance  $C_g$  –Standard unit of capacitances calculation –The delay unit –Inverter delays –Driving large capacitive loads –Propagation delay –Wiring capacitances.

#### **UNIT-3: SCALING OF MOS CIRCUITS**

Scaling models and scaling factors –Scaling factors for device parameters –Some discussion on and limitations of scaling.

#### **UNIT-4: SUBSYSTEM DESIGN AND LAYOUT**

Some architectural issues –Switch logic –Gate (restoring) logic –Examples of structured design (combinational logic) –Some clocked sequential circuits –Other system considerations.

#### **UNIT-5: ILLUSTRATION OF THE DESIGN PROCESS– COMPUTATIONAL ELEMENTS**

Some observations on the design process –Regularity –Design of an ALU subsystem –A further consideration of adders –Multipliers.

#### **BOOKS FOR STUDY:**

1. BASIC VLSI DESIGN “Douglas A. Pucknell & Kamran Eshraghian” – Eastern Economy Edition, IIIrd Edition

## **SEMESTER I**

### **PAPER IV: DIGITAL SYSTEM DESIGN USING VHDL**

**UNIT I:** Specification of Combinational Systems Using VHDL, Introduction to VHDL, Basic Language Element of VHDL, Behavioral Modeling, Data Flow Modeling, Structural Modeling, Subprograms and Overloading, VHDL Description of Gates.

**UNIT II:** Description and Design of Sequential Circuits Using VHDL, Standard Combinational Modules, Design of a Serial Adder With Accumulator, State Graph for Control Network, Design of a Binary Multiplier, Multiplication of a Signed Binary Number, Design of Binary Divider.

**UNIT III:** Register –Transfer Level Systems, Execution Graph, Organization of System, Implementation of RTL Systems, Analysis of RTL Systems, and Design of RTL Systems.

**UNIT IV:** Data Subsystems, Storage Modules, Functional Modules, Data Path, Control Subsystems, Micro Programmed Controller, Structure of a Micro Programmed Controller, Micro Instruction Format, Micro Instruction Sequencing, Micro Instruction Timing, Basic Component of a Micro System, Memory Subsystem.

**UNIT V:** I/O Subsystem, Processors, Operation of the Computer and Cycle Time. Binary Decoder, Binary Encoder, Multiplexers and Demultiplexers.

Floating Point Arithmetic –Representation of Floating Point Number, Floating Point Multiplication.

#### **BOOK FOR STUDY:**

1. J. Bhaskar, “A VHDL Primer”, Addison Wesley, 1999.

#### **REFERENCE BOOK:**

2. C. H. Roth, “Digital System Design Using VHDL”, PWS Publishing.
3. J. F. Wakerly, “Digital Design-Principles and Practices”. PHL.
4. Z. Navabi, “VHDL-Analysis and Modeling of Digital Systems”, MGH.

**SEMESTER I**  
**DIPLOMA IN INFORMATION TECH.**

**PAPER –I - WEB TECHNOLOGIES**

**UNIT I**

Internet working concept - Devices: Repeaters – Bridges – Routers – Gateways – Internet topology Internal Architecture of an ISP – Address – Basics of TCP – Features of TCP-UDP.

**UNIT II**

DNS – Email – FTP – HTTP – TELNET – Electronic commerce and web technology – Aspects – Types – E – procurement models – Solutions – Supply main management – Customer Relationship Management – Features Required for enabling e-commerce – Tiers – concept of a Tier.

**UNIT III**

Web page – static web pages – Dynamic web pages – DHTML – CGI – Basics of ASP technology – Active web pages – User Sessions: Sessions and session Management – Maintaining state information – Transaction Management: Transaction Processing monitors – Object Request Brokers – Component transaction – monitor – Enterprise Java Beans.

**UNIT IV**

Security issues : Basic concepts – cryptography – Digital signatures – Digital certificates – Security Socket Layer (SSL) – Credit card Processing models – Secure Electronic Transaction – 3D Secure Protocol – Electronic money – Electronic Data Interchange : Overview of EDI – Data Exchange Standards – EDI Architecture – EDI and the Internet.

**UNIT V**

Extensible Markup Language(XML) – Basics of XML – XML Parsers – Need for a standard – Limitations of mobile devices – WAP Architecture – WAP stack – Object technology.

**BOOK FOR STUDY**

1.Achyat.s.Godbole and Atul Kahate, “Web Technologies”, Tata McGraw Hill pub.Co.Delhi,2006

**REFERENCES**

1. Ellote Rusty Harold , “Java Network Programming” , O’Reilly Publications,1997.
2. Jason Hunter , William Crawford, “Java Servlet Programming” , O’Reilly Publications,1998.

## **SEMESTER II**

### **PAPER V: DATA COMMUNICATION NETWORKS**

#### **UNIT I: INTRODUCTION TO DIGITAL COMMUNICATION SYSTEMS**

Communication Links –Data Communication System –Synchronous and Asynchronous Data, Binary Data Signal –Serial Vs Parallel Communications.

Pulse Modulation: Sampling Theory –PAM, PWM, PPM Modulation and Detection – Time Division Multiplexing –Frequency Division Multiplexing Quantizing of Analog Signal – SNR Behavior –PCM Principles –Data Modulation –ASK-FSK-PSK-DPSK.

#### **UNIT II: STRUCTURE OF NETWORK COMMUNICATION**

Network Topologies–Fundamentals of Communication Theory –Synchronizing Network Components –Communication Protocols –Polling/Selection System –Non Polling System –Peer to Peer Non Priority System –Peer to Peer Priority System.

#### **UNIT III: LAYER AND THEIR FUNCTIONS**

OSI Reference Model –Physical Layer –Data Layer –Network Layer –Transport Session and Application Layer.

MODEM: Modulation Techniques –Multilevel Transmission –Advance in Modem.

SWITCHING: Circuit Switching –Message Switching –Compressing.

#### **UNIT IV: NETWORK HARDWARE LAN**

LAN Definition –Major Components of LAN –Protocols –IEEE Standards –CSMA/ CD –Token Ring –Token Bus –FDDI –Logical Link Control.

#### **UNIT V: LAN HARDWARE AND COMPONENTS**

Digital Network: Signal Conversion –Digital Carrier System –Channel and Data Service Units –ISDN –Narrow and Broad Band ISDN –Switches and HUBS –Bridges –Routers – Structured Cabling.

Application of Data Communication: Internet Concepts –Features and Tools.

#### **BOOKS FOR STUDY:**

1. Prokis J J, “Digital Communication” TMH Pub. Co Ltd II Edition (Unit I)
2. A S.Tanenbaum, “Computer Networks” PHI Publisher (Unit II, III & V)
3. Ulysess Black “Data Communication and Distributed Network”, III Edition (Unit IV)
4. B.P.LATHI, “Modern Digital & Analog Communication System”.
5. Singh & Singh, “Internet Concepts, Problem and Solution”.

## **SEMESTER II**

### **PAPER VI: PC BASED SYSTEM DESIGN**

#### **UNIT I: MOTHER BOARD OF IBM PC**

Components Of IBM PC: System Unit –Monitor –Input Devices –Printers –Interfaces –I/O Buses –Parallel and Serial Bus –USB

Motherboard Components: Introduction –Microprocessor –Support Chips –Memory –Support Functions –I/O Buses, System Resources: Interrupt Requests –DMA Channels –I/O Address –Utilization Of System Resources.

#### **UNIT II: DRIVERS**

Introduction –Principles of Magnetic Storage: Medium for Magnetic Storage –Read/Write Operations –Data Encoding Format. FDD: Floppy Disk Drive –Construction –Floppy Disk Controller 8272A –FDC Interface. HDD: Drive Construction –HDD Interface. IDE Interface: Pins and Signals –Registers –Command Execution Protocol –Commands –Medium Organization –EIDE Interface. SCSI Interface: SCSI Configuration –Variations –Signals –Wiring Techniques –Cables and Connectors –Termination –Phase – Commands and Messages.

#### **UNIT III: PERIPHERALS**

Introduction –Video Display System: CRT Display –Video Display Adapters –LCD Monitors –Keyboard –Keyboard Organization –Keyboard Interface. BIOS Keyboard Service, Mouse: Mouse Interface Types –Mouse Modes of Operation –BIOS Mouse Services. Printer: Types –Printer Interface.

#### **UNIT IV: I/O BUSES**

Introduction-ISA Bus: Pins, Signals and Expansion Board Design of 8-Bit and 16 Bit ISA Bus-EISA Bus: Features –Pins And Signals, PCI Bus: Features –PCI System –Pins And Signals- PCI Expansion Boards –AGP.

#### **UNIT V: PARALLEL, SERIAL AND USB PORT**

Parallel Port: Introduction –Parallel Port –SPP –EPP –ECP. Serial Port: Pins and Signals of Serial Port –The UART. USB Port: Introduction –Features –USB System –USB Transfer –USB Controller.

#### **BOOKS FOR STUDY:**

1. N.Mathivanan, "Microprocessor, PC Hardware and interfacing", PHI ISBN-81-203-2317-3
2. B.Govindarajulu, "IBM PC and Clones", TMH, ISBN-0-07-460136-9



## **SEMESTER II**

### **PAPER VII: CMOS VLSI DESIGN**

#### **UNIT I: INTRODUCTION TO CMOS CIRCUITS**

MOS Transistors –MOS Transistor Switches –CMOS Logic –Circuit and System – Representations –MOS, Transistor Theory –Introduction –MOS Device Design Equations –The Complementary CMOS Inverter –DC –Characteristics –Static Load MOS Inverters –The Differential Inverter –The Transmission Gate –The Tri State –Inverter –Bipolar Devices.

#### **UNIT II: CIRCUIT CHARACTERISATION AND PERFORMANCE ESTIMATION**

Introduction –Resistance Estimation Capacitance Estimation –Inductance –Switching Characteristics CMOS –Gate –Transistor Sizing –Power Dissipation –Sizing Routing Conductors –Charge Sharing –Design Margining, Reliability.

#### **UNIT III: CMOS CIRCUIT AND LOGIC DESIGN**

CMOS Logic Gate Design –Basic Physical Design of Simple Gate –CMOS Logic Structures –Clocking Strategies –I/O Structures –Low Power Design.

#### **UNIT IV: SYSTEMS DESIGN AND DESIGN METHOD**

Design Strategies CMOS Chip Design Options –Design Methods –Design Capture Tools –Design Verification –Tools –Design Economics –Data Sheets –CMOS Testing –Manufacturing Test Principles –Design Strategies for Test –Chip Level Test Techniques –System Level Test Techniques –Layout Design for Improved Testability.

#### **UNIT V: CMOS SUB SYSTEM DESIGN**

Data Path Operations –Addition/Subtraction –Parity Generators –Comparators – Zero/One Detectors –Binary Counters –ALUs –Multiplication –Shifters –Memory Elements – Control –FSM –Control Logic Implementation.

#### **BOOKS FOR STUDY:**

1. Nell H. E. Weste and Kamran Eshraghian, "Principles of CMOS VLSI Design", 2nd Edition, Addison Wesley, 1998.
2. Jacob Backer, Harry W. Li and David E. Boyce, "CMOS Circuit Design, Layout and Simulation ", Prentice Hall of India, 1998.

## **SEMESTER II**

### **PAPER VIII: ASIC DESIGN**

#### **UNIT I: INTRODUCTION TO ASIC**

Types of Asics – Design Flow –CMOS Transistors CMOS Design Rules – Combinational Logic Cell –Sequential Logic Cell –Data Path Logic Cell –Transistors And Resistors –Transistor Parasitic Capacitance –Logical Effort –Library Cell Design –Library Architecture.

#### **UNIT II: XILINX AND ALTERA ASIC**

Anti Fuse –Static RAM –EPROM and EEPROM Technology, PREP Benchmarks –Actel ACT –Xilinx LCA –Altera FLEX –Altera MAX DC & AC Inputs and Outputs –Clock & Power Inputs –Xilinx I/O Blocks.

#### **UNIT III: ASIC AND ITS TOOLS**

Actel ACT –Xilinx LCA –Xilinx EPLD –Altera MAX 5000 and 7000 –Altera MAX 9000 –Altera FLEX –Design Systems –Logic Synthesis –Half Gate ASIC Schematic Entry –Low Level Design Language –PLA Tools –ENDIF –CFI Design Representation.

#### **UNIT IV: LOGIC SYNTHESIS, SIMULATION AND TESTING**

Verilog and Logic Synthesis –VHDL and Logic Synthesis –Types of Simulation – Boundary Scan Test –Fault Simulation Automatic Test Pattern Generation.

#### **UNIT V: ASIC CONSTRUCTION, FLOOR PLANNING, PLACEMENT AND ROUTING**

System Partition –FPGA Partitioning –Partitioning Methods –Floor Planning –Placement –Physical Design Flow –Global Routing –Detailed Routing –Special Routing –Circuit Extraction –DRC.

#### **BOOKS FOR STUDY:**

1. M.J.S. Smith, “Application – specific integrated circuits” –Addison – Wesley Longman Inc. 1997.
2. Andrew Brown, - “VLSI circuits and systems in silicon”, Mc Graw Hill, 1991.
3. S.D. Brown, R.J. Francis, J.Rox, Z.G. Uranesic, “Field Programmable gate arrays”, Khuever academic publisher, 1992.
4. S.Y.Kung, H.J. Whilo House, T.Kailath, “VLSI and Modern Signal Processing”, Prentice Hall, 1985.

**SEMESTER II**  
**DIPLOMA IN INFORMATION TECHNOLOGY**

**PAPER II : RELATIONAL DATA BASE MANAGEMENT SYSTEMS**

**UNIT I: INTRODUCTION**

Purpose of Data base systems- View of Data Modules- Data base Languages- Transaction Management- Storage Management data base Administrator- Data base Users- System Structure. ENTITY Relationship Model: Basic concepts- keys- Entity Relationship Diagram- Weak Entity sets, E-R Features., Specialization, Generalization  
Relational Model: Structure of Relational Data Base- Relational Algebra- Views.

**UNIT II: SQL BACKGROUND**

Basic structure- Set Operations- Aggregate functions- Null values- Nested Sub Queries- Derived Relations- Views- Modification of the data base- joined Relations- Data Definition Language- Embedded SQL features.

**UNIT III: INTEGRITY CONSTRAINTS**

Domain Constraints-Referential Integrity- Assertions- Triggers- Functional Dependencies.  
Relational Data Base design: Pitfalls- Normalization  
Object Oriented Data Base: New Data Base Applications- Object Oriented Data Model- Object Oriented Languages- Persistent Programming languages.

**UNIT IV :OBJECT RELATIONAL DATEBASES**

Nested Relations – Complex types and Object Orientation – Querying with complex data types – creation of complex values and objects – comparison of Objects Oriented Relational databases.

**UNIT V: APPLICATIONS**

Decision support system – Data analysis – Data Mining – Data Warehousing – Spatial and geographic databases – Multimedia databases – Mobility and personal databases – Information – Retrieval Systems – Distributed information systems – The World Wide Web.

**BOOKS FOR STUDY:**

1. Abraham Silberschatz, Henry F. Korth, S.Sudarson, “Database concepts”, Tata McGraw Hill International Editions 1997.

**BOOKS FOR REFERENCE:**

1. Alexis Leon and Mathews Leon, “Database management system” Vikas pub.
2. Elmasri Navathw, “Fundamentals of database systems”, Pearson Education pub, 3<sup>rd</sup> Edition 2001.

## **SEMESTER II**

### **PRACTICAL I: GENERAL ELECTRONICS & 8051 MICROCONTROLLER LAB**

#### **Any 15 Experiments**

1. AM Modulation and Detection
2. FM Modulation and Detection
3. ASK Modulation and Detecting
4. PWM and PPM Modulation and Detection
5. PAM Modulation and Detection
6. DC to DC converter
7. DC Voltage Regulator Design
8. DC Chopper
9. Modular SMPS Design
10. Switching Regulators
11. Addition and subtraction of 8bit /16 bit data.
12. Multiplication of 8 and 16 bit data
13. Ascending and Descending order
14. Checksum/CRC error calculations programming
15. Keypad/Seven segment display interfacing
16. LCD Interfacing
17. Hardware and software time delay generation
18. UART Programming
19. ADC interfacing
20. DAC Interfacing

## **SEMESTER II**

### **PRACTICAL II: VLSI LAB I**

#### **Any 15 Experiments**

1. Implementation of Logic gates
2. Sequential and combinational logic design
3. Encoder Design
4. Decoder Design
5. Half adder and full adder
6. Half Sub tractor
7. Latches and Flip flops
8. Parity Generator
9. Parity encoder
10. Hardware multiplier
11. Shift Register and Ring counter
12. ALU design
13. Keypad /Seven segment programming
14. LCD programming
15. Implementation of UART
16. Programmable clock generator
17. VGA Interface controller
18. SPI/ I<sup>2</sup>C Implementation
19. Graphical display controller design
20. RAM system design.