DEPARTMENT OF ELECTRONICS

M Sc ELECTRONICS COURSE

STRUCTURE OF THE COURSE

First Semester Papers

EL 401: Analog Devices and Circuits

EL 402: Digital Circuits and Systems

EL 403: Microprocessors and Interfacing

EL 404: Programming in C/C++.

EL 405: Practical I (Analog and Digital Experiments)

EL 406: Practical II (Microprocessor and Programming)

EL 407: Seminar / Mini-project**

Second Semester Papers

EL 451**:** ASIC and HDL

EL 452: Digital Signal Processing

EL 453: Computer organization and Architecture

EL 454: VLSI Design

EL 455: Practical I (Digital Signal Processing Experiments)

EL 456: Practical II (VLSI and VHDL Experiments)

EL 457: Seminar/ Mini-project**

Third Semester Papers

EL 501: Electronic Instrumentation (Open Choice)

EL 502: Image Processing

EL 503: Analog and Digital Communication

EL 504: Embedded System Design

EL 505: Practical I (Analog and Digital Communication Experiments)

EL 506: Practical I (Image Processing and Embedded System Experiments)

EL 507: Seminar / Mini-project**

Fourth Semester

Project work in an Industry/recognized Institutes/Laboratories for duration of 24 Weeks.

****** All Seminars /Mini-projects to be assessed internally**.**

EL 401: Analog Devices and Circuits

UNIT I

Basic Devices: The r_e transistor model – Small signal analysis of CE configuration. Comparison of the result of CE with CB and CC configurations, Hybrid parameters, analysis of voltage divider bias CE configuration using hybrid equivalent model. Frequency response (low and high) of BJT CE amplifier.

Characteristics of JFET and MOSFET –voltage divider bias – small signal analysis of JFET and MOSFET in CS configuration, Comparison of the results of CS configuration with CG and CD configuration.

Two stage cascade amplifiers with BJT and FET. Cascaded amplifiers (Darlington connection). CMOS circuit, Current source circuit, current mirror circuit, Differential amplifier circuit.

18 HOURS

UNIT II

Op-Amps: Introduction to Op-amp, internal block diagram, Characteristics of practical op-amp. Negative feedback, Op-amp with negative feedback and its effect on op-amp impedances. Bias current and offset voltage compensation, open loop and closed loop response.

Op-amp Applications: Comparators, Summing amplifier, Integrator, Differentiator, Isolation amplifier, Instrumentation Amplifier, Active filters (first order, second order Butterworth filters).

16 HOURS

UNIT III

BJT power amplifier circuits – Efficiency and harmonic distortion – Class A, Class B and Class AB operation, Power transistor heat sinking.

Other Devices: SCR operation and its applications, UJT characteristics and its applications. Application of Triac in phase (power) control.

High frequency devices – Gunn diode, Microwave Transistor, Microwave FET, Klystron, CCD, Read diode, IMPATT diode, TRAPPAT diode, BARRIT diode.

16 HOURS

Text Books:

1. Boylestad and Nashelsky, "Electronic devices and Circuits theory", 8th Edn. (Prentice Hall of India 2002)
2. Floyd T L "Electronic Devices", 5th Edn. (Pearson Education Asia 2002).
3. Samuel.Y.Liao, "Microwave devices and Circuits", 3rd Edn, Prentice Hall of India.

Reference Books:

1. R.A. Gayakwad, "Op-amps and linear integrated circuits", 3rd edn. (Prentice Hall of India 2002).
2. Sedra and Smith "Microelectronic Circuits", 4th Edn. (Oxford University Press (India))

EL 402: Digital Circuits and Systems

UNIT I

Memories: Basics of semiconductor memory, RAMS, ROMS, PROM's and EPROM's. Flash memories, magnetic and optical storage memories.

Digital IC technologies : Basic operational characteristics and parameters – CMOS circuits, TTL circuits , practical considerations in using TTL, Comparison of CMOS and TTL performance , ECL circuits – PMOS, NMOS and E^2CMOS.

16 HOURS

UNIT II

Programmable logic devices – Programmable array logic (PAL) structure and its operation (PAL 16L8). Generic array logic (GAL) structure and its operation (GAL 22V10) – Output logic macro cells (OLMS). Implementing sum of product function. PLD fundamentals, PLD architecture. Sequential logic application – OLMC mode selection of GAL 22V10 – implementing keypad encoder.

Digital Circuits and system design: Review of Combinational and Sequential logic design, Digital system design and implementation options. Introduction to PLDs, FPGAs.

18 HOURS

UNIT III

Hardware Description Language: VHDL: syntax, semantics, identifiers and literals, entities and architectures, packages and libraries, interface declarations, type declaration, other declaration, sequential statements, operator, concurrent statements, execution, configuration and specification, example programs.

16 HOURS

Text Books:

1. Floyd T L "Digital Fundamentals", 8th Edn. (Pearson Education Asia 2002).
2. Tocci R.J. and Widmer N S "Digital Systems", 8th Edn. (Pearson Education Asia 2002).
3. Wakerly J F "Digital design", 3rd Edn. (Pearson Education Asia 2002).
4. S.S Limaye "VHDL A Design Oriented Approach ", (Tata Mc'Graw Hill Pub.2008).

Reference Books:

1. Mano M M "Digital Design", 3rd Edn. (Pearson Education Asia 2002).
2. M. J. S. Smith "Application Specific Integrated Circuits", Pearson Education.
3. C.H. Roth "Digital system design using VHDL", PWS Publishing,
4. Peter Ashenden, "The Designer's Guide to VHDL", Morgan Kaufman.

EL 403: Microprocessors and Interfacing

UNIT I

Review of 8085 microprocessor– Internal architecture and Internal operations. Addressing Modes, Instruction Formats, Instruction Execution Timings.

8086 processor- Internal architecture of 8086, Instruction set – Data transfer instruction, Arithmetic instructions – Binary and BCD arithmetic. Branch instructions – conditional and unconditional, Loop instructions, Logical instructions, Flag manipulation, Shift and rotate instructions and programming.

16 HOURS

UNIT II

8086 features- Assembler Directives, 8086 system connection, Timing and troubleshooting, 8086 interrupts and interrupt applications. Digital Interfacing, Analog interfacing and industrial control.8086 Maximum mode, Co-processor, EDA tools.

Advanced Microprocessors – Introduction, Multiprogramming concepts, memory management concepts, virtual memory – segmentation scheme.

18 HOURS

UNIT III

The 80286 internal architecture – Real and Protected mode operations, Task switching, single level tasks, multilevel tasks and multiple tasks.

The 80386 and 80486 Microprocessors – The 80386 architecture and features, the memory system. The 80386 memory management unit(MMU) - real and protected mode operation. Virtual 8086 mode – paging mechanism. The 80486 – Introduction, architecture and advanced features, 80486 memory system. The Pentium – architecture, and advanced features.

Programmable Peripheral Devices. **16 HOURS**

Text Books:

1. Douglas V Hall, "Microprocessor and interfacing, programming and hardware", Tata McGraw Hill, Reprint 2nd Edn. 2000.
2. Barry.B.Brey, "The intel Microprocessor 8086/8088, 80186/80188, 80286, 80386, 80486, PENTIUM and PENTIUM PRO Processor – Architecture, Programming and Interfacing", (Pearson Education Asia), 6th Edn. 2002.

Reference Books:

1. Yu-Cheng Liu, Glenn A Gibson, "Micro Computer Systems: The 8086/8088 family – architecture, programming and design", Prentice Hall of India Pvt. Ltd., New Delhi, 2nd Edn. 2000.
2. Ramesh S Gaonkar, "Microprocessor architecture, programming and application with 8085", 4th Edn. (penram International Pub. House).

EL 404: Programming in C/C++

UNIT I

Advanced Programming in C: Review of basic C programming concepts and Techniques. Arrays (Defining an array, Processing an array, multidimensional arrays, Arrays and strings), Functions (Defining a function, Accessing a function, Passing arguments to a function, Specifying Argument Data Types, Function Prototypes), User defined functions, handling of character strings, Pointers(Pointer declaration, passing pointers to a function Operations on pointers, Pointers and Multi-dimensional Arrays, Arrays of Pointers, Passing functions to other function).

16 HOURS

UNIT II

Structures and Unions (User-defined data types, Structures and pointers, passing structures to a function, self referential structures), file management in C, dynamic memory allocation and linked lists, Low-level programming (register variables, bitwise operations, bit fields).

Key concepts of C++ programming: Object Oriented Programming (OOP), Advantages of OOP, and Characteristics of OOP. Objects and classes (definition, specifying a class, objects as physical objects and as data types, constructors and destructors, objects function arguments, returning objects form functions structures and classes static class data).

18 HOURS

UNIT III

Advanced concepts of C++ programming: Concept of operator loading, Inheritance, pointers, virtual functions and dynamic polymorphism.

Device drivers using C in UNIX: Types of device drivers, gross anatomy of device drivers, general programming considerations, a test data generator, device driver for an A/D converter, a line printer and COM1 ports.

16 HOURS

Text Books:

1. Balagurusamy E, “Programming in C”, Tata McGraw Hill Pub.
2. Balagurusamy E, “Object oriented Programming with C++”, Tata McGraw Hill Pub.
3. George Pajari, “Writing UNIX device drivers”, Adison Wesley.

Reference Books:

1. Robert Lafore, “Turbo C++ Programming”, Galgotia Pub, Indian Edition.
2. Mathivanan, “PC based instrumentation”, PHI.
3. Jan Ahelsom, “Parallel port complete”, Penram publication.
4. Jan Ahelsom, “Serial port complete”, Penram publications.
5. Yaswanth Kanitkar, “Writing TSR through C”, BPB publications.

EL 451: ASIC DESIGN and HDL

UNIT I

Introduction to ASIC: Types of ASICs , design flow**.**

CMOS Logic: CMOS transistors, CMOS process, CMOS design rules, combinational logic cell, sequential logic cell, data path logic cells.

ASIC Library Design: transistors as resistors, transistor parasitic capacitance, logical effort.

16 Hours

UNIT II

Programmable ASIC Logic Cells: Actel ACT 191, Xilinx LCA 204, Altera Flex, Altera Max 209.

Programmable ASIC: The antifuse, static RAM, EPROM, EEPROM technology.

Programmable ASIC I/O Cells: DC output, ac output, DC input, ac input, clock input, power input.

Programmable ASIC Interconnect: Actel ACT 275, Xilinx LCA 284,Altera Max 5100 and 7000.

Programmable ASIC Design Software: Digital Systems, Logic Synthesis.

Low Level Design Entry: Schematic entry, Low level desing languages.

18 Hours

UNIT III

Verilog HDL: Basics of Verilog language, operators, hierarchy, procedures and assignments, timing controls and delays, tasks and functions, Control statements. Logic gate modeling, Modeling delay, Altering parameters, Other Verilog features, PLA tasks, Example programs.

Verilog and Logic synthesis, combinational logic, multiplexers, decoders in Verilog simulation.

16 Hours

Text Books:

1. MJS Smith, “Application Specific Integrated Circuits”, Pearson education.

Reference Books:

1. Samir Palnitkar, “Verilog HDL”, Pearson education.
2. Brown and Vranesic, “Fundamendals of Digital logic with Verilog design”, TMH.
3. J. Bhaskar, “Verilog HDL Synthesis”, BS Publications.

EL 452: DIGITAL SIGNAL PROCESSING

UNIT I

Introduction-Classification of signals, the concept of frequency in CT and DT signals, A/D and D/A conversion. DT signals and systems- DT signals, DT systems, analysis of DT-LTI systems, difference equations, Correlation of DT signals.

Z-Transform and its application to the analysis of LTI systems- Definition of Bilinear Z-Transform, properties, rational ZT, Inverse Z Transform methods, Analysis of LTI systems in Z-domain. One sided Z Transform applications.

16 HOURS

UNIT II

Frequency analysis of signals - CTFS, CTFT, DTFS, DTFT, Properties of DTFT.

Frequency domain analysis of LTI systems- Frequency domain characterization of LTI systems, Frequency response of LTI systems, Correlation functions and spectra at the output of LTI systems, LTI systems as frequency selective filters, Inverse systems and deconvolution.

DFT: definition, DFT as a linear transformation, Properties of DFT, linear filtering using DFT-use of DFT in linear filtering, filtering long sequences-overlap save method, overlap add method.

Fast Fourier Transform (FFT) - Radix-2 DIT and DIT direct and inverse algorithms, Goertzel algorithm.

18 HOURS

UNIT III

Implementation of DT systems- Structures for FIR systems- Direct form, cascade form, frequency sampling structure, lattice structure. Structures for IIR systems- Direct form, transposed structure, cascade form, parallel form, lattice and lattice ladder structures.

Design of Digital Filters: General considerations, design of FIR filters-Window method, frequency sampling method. Design of IIR filters form analog filters- Impulse invariant method and BZT method.

16 HOURS

Text Books

1. John G. Proakis and Dimitris G. Manolakis, “Digital signal processing”. PHI Pub.

Reference Books:

1. B.P. Lathi, “Signal Processing and Linear systems”,
2. Ifeacher and Jervis, “Digital signal processing- a practical approach”,
3. Simon Haykin, “Signals and systems”,
4. Mc Chellan, R.W shafer & Yoder “Signal Processing First”
5. A.V.Oppenheim and Schafer, “Discrete time signal Processing”

EL 453: Computer Organization and Architecture

UNIT I

Basic Structure of Computer Hardware: Functional Units, Basic Operation Concept, Bus Structure, Software, Distributed Computing. Addressing Methods And Program Sequencing– Memory Operation, Instructions And Instruction Sequencing.

Central processing unit: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer And Manipulation, Program Control.

16 HOURS

UNIT II

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache and Virtual Memories, Memory Management Hardware.

Input Output Organization: Peripheral Devices, Input Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access Input- Output Processor, Serial Communication

Micro Programmed Control: Control Memory, Address Sequencing, Micro Program Example, Microinstruction Format, Design of Control Unit, Micro Program Sequencer

16 HOURS

UNIT III

Pipeline and vector processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing.

Microprocessor characteristics: RISC Processor, RISC Characteristic, CISC Characteristics, Array Processors, Arm Processors, DSP processors.
Multiprocessors – characteristics, Interconnects, arbitration, communication, synchronization, cache coherence.

18 HOURS

Text Books:

1. Morris Mano, "Computer System Architecture", Prentice Hall of India, 3rd Edn.
2. Hamacher, Vranesic & Zaky, " Computer Organisation", McGraw Hill.

Reference Books:

1. A.S. Tannenbaum, "Structured Computer Organization", 4th Edn. Prentice Hall of India.
2. Lapsley *et al*, "DSP Processor Fundamentals", S Chand and Co, New Delhi.

EL 454: VLSI DESIGN

UNIT I

Digital system and VLSI: Integrated Circuit Manufacturing, CMOS Technology, Integrated Circuit Design Technique.

Transistor and layout: Fabrication Process, Transistors, Wires and Vias, Design Rules, Layout Design and Tools.

Logic gates: Combinational Logic Functions, Static Complementary Gates, Switch Logic, Alternative Gate Circuits, Low Power Gates, Delay Through Resistive Interconnect, Delay Through Inductive Interconnect.

14Hours

UNIT II

Combinational logic networks: Standard Cell Based Layout, Simulation, Combinational Network Delay, Logic And Interconnect Design, Power Optimization, Switch Logic Networks, Combinational Logic Testing.

Sequential machines: Latch And Flip-Flops, Sequential System and Clocking Disciplines, Sequential System Design, Power Optimization, Sequential Testing.

Subsystem design: Subsystem Design Principles, Combinational Shifters, Adders, ALUs, Multipliers, High Density Memory, One Transistor Dynamic Ram, Field Programmable Gate Arrays, Programmable Logic Array.

18Hours

UNIT III

Floor planning: Floor Planning Methods, Off-Chip Connections.

Architecture Design; Hard Description Languages, Register Transfer Design, High Level Synthesis Architecture for Low Power, System –On Chip and Embedded System CPUs, Architecture Testing.

Chip Design: Design Methodologies, Kitchen Timer Chip, and Microprocessor Data Path.

Cad System And Algorithms: CAD System, Switch Level Simulation, Layout Synthesis, Layout Analysis, Timing Analysis And Optimization, Logic Synthesis Test Generation, Sequential Machine Optimization, Scheduling And Binding, Hardware/Software Co Design.

18Hours

Text Books:

1. Wayne wolf, “Modern VLSI DESIGN”, 3rd edn, PHI.

Reference Books:

1. John P.Uyemura, “Introduction to VLSI circuits and systems”, John Wiley.
2. Douglas A .pucknell & Kamran Eshraghian, “Basic VLSI design”, 3rd edn, PHI.

EL 501: Electronic Instrumentation (Open Choice Paper)

Unit I

Measurement of Voltage and Current. Voltmeter, Ammeter (Block diagram and working). **Multimeters**- Digital multimeter, measurement of Voltage, Current resistance and frequency.
Circuit Components- Resistors, Capacitors, Inductors and their functions in the circuits. Concept of rectifiers, filters. Simple power supply circuits.
Instrumentation: Definition, Block diagram of measuring Instrument. Transducer- definition, Types of transducers, Electrical transduction principles. Amplifier-definition, Block diagram and working. Examples-Transistor amplifier, Op-Amp.
Feedback- Positive feedback, Negative feedback. Systems-Open loop system, Closed loop system.

16 Hours

Unit II

Automation of Instruments: Analog signals, Digital signals, Block diagram of A/D & D/A converters. Control System, Feedback Control system (Definition and Block diagram)
Microprocessor- Block diagram, Connection to memory, Instruction set, program structure, Simple programs.
Microcontroller- Block diagram, Difference between Microprocessor and Microcontroller. Their applications in Typical Instruments.
Mp-based Instrumentation- measurement of Voltage, Interfacing concepts.
PC-based Instrumentation: Data acquisition systems, Computer Block diagram, Peripherals, BIOS services, ports in a computers. GPIB system, RS-232 system, USB system.

16 Hours

Unit III

Display devices: Structure and principle of working of Seven Segment display, LED display, LCD display.
Biomedical Instrumentation: Bio-potential, Cardio vascular system, ECG, ECG recording, Electrodes for recording ECG, EEG and EMG signals, ECG Interpretation, EEG, EMG, Blood pressure measurement, Sonography, CT Scan, Use of computer in CT scan, MRI Techniques. Bio-telemetry, Transducers for physiological parameter reading and their characteristics.

16 Hours

Text Book:

1) Electrical and Electronics measurements and Instrumentation, A. K. Dhanpet Rai & Co., 18th edition 2009.

Reference books:

1) Transducers and Instrumentation, DVS Murthy, PHI Publications, 2000.
2) PC Based Instrumentation, Concepts and practice, N. Mathivannan, PHI, 2009
3) Electronic Instrumentation and measurements, David. A. Bell, PHI, 2nd edition
4) Biomedical Instrumentation and measurements, Cromwell, Weibell and Pfeiffer, PHI, 15th Edition.

EL 502: Image Processing

UNIT I

Introduction: What Is Digital Image Processing, Examples of DIP, Fundamental Steps in DIP, Components of an Image Processing System.

Digital Image Fundamentals: Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization,, Some Basic Relationships Between Pixels, Mathematical tools used in DIP. **14 Hours**

UNIT II

Intensity Transformations and Spatial Filtering: Some basic intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods.

Filtering in Frequency Domain: Preliminary concepts, Sampling, Fourier Transform of sampled Functions, The DFT of one variable, Extension to functions of two variables, Properties of 2D DFT, Basics of Filtering in the Frequency Domain, Image Smoothing using Frequency-Domain Filters, Image Sharpening using Frequency Domain Filters, Selective Filtering, Implementation. **18 Hours**

UNIT III

Image Restoration and Reconstruction: Model of the Image Degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise Only–Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering, Geometric Mean Filter, Image reconstruction from projections.

Color Image Processing: Color Fundamentals, Color Models, Pseudo-color Image Processing, Full-Color Image Processing, Color Transformations, Smoothing and Sharpening, Image Segmentation based on color, Noise in Color Images, Color Image Compression.

18 Hours

Text Books:

1. Rafael Gonzalez and Richard Woods, "Digital Image Processing", 2nd Edition, PHI.

Reference Books:

1. A. K. Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 1989.
2. W. K. Pratt, "Digital Image Processing", Prentice Hall, 1989.
3. A. Rosenfold and A. C. Kak, "Digital Image Processing", Vols. 1 and 2, Prentice Hall, 1986.
4. H. C. Andrew and B. R. Hunt, "Digital Image Restoration", Prentice Hall, 1977.

EL 503: Analog and Digital Communication

UNIT I

Modulation techniques: Review of Amplitude modulation – Principles of AM - AM Circuits, AM Transmitters, AM Reception – Receiver parameters. AM receivers – Super heterodyne receiver, Single Side band techniques. Angle Modulation – Frequency modulation, Pre-emphasis, De-emphasis, PLL FM transmitter, FM receivers, Introduction to Phase modulation.

Pulse Modulation – PAM, PPM, PCM, – Introduction. Sampling, Waveform coding, Delta modulation, Adaptive delta modulation, Differential PCM, ASK, FSK, DPSK, QPSK**. 16 Hours**

UNIT II

Noise in communication systems : Types of Noise, Noise figure, Noise Temperature, Noise Calculations – Noise in cascaded systems, Brief introduction to Noise in AM Systems, FM systems and in digital modulation schemes.

Spread spectrum signals for digital communications: Introduction to Spread Spectrum Modulation, DSSS, FHSS, CDMA signals, Code Acquisition and Tracking, Spread Spectrum as a Multiple Access Technique; Multichannel and Multicarrier Systems; Digital Communications through Fading Multipath channels; Multi User Communications. **16 Hours**

UNIT III

Optical Fiber Communication: Optical Fibers : Structure and wave guides, fundamentals, Nature of light, basic optical laws and definitions, optical fiber types, Rays and modes, ray optics. Signal degradation in optical fibers, attenuation, scattering losses, radiative losses, absorption losses, core and cladding losses, signal distortion in optical wave guides, group delay, dispersion, pulse broadening in graded index wave guide.

Optical sources: LEDs, structure, source materials, internal quantum efficiency, modulation. Laser diodes: Structures, threshold conditions, modal properties and radiation patterns, modulation of laser diodes, temperature effects, light source linearity, reliability considerations.

Optical Receiver Operations : Fundamental receiver operations, digital signal transmission, error sources, receiver configuration, digital receiver performance calculations, receiver noise, Shot noise, Sensitivity, non zero extinction ratio, pre amplifier design, high impedance FET amplifier, high impedance bipolar transistor amplifier, trans impedances amplifier, analog receivers.

18 H**ours**

Text Books:

1. Wayne Tomasi, "Electronic Communication Systems", Pearson Education Asia, 3rd Edn.
2. George Kennedy & Bernard Davis, "Electronic Communication Systems", TMH pub.
3. Simon Haykin, "Communication Systems", 4th Edn. John Wiley.
4. Gred Keiser, "Optical Fibre Communication ", McGraw Hill, 3rd Edn.

Reference Books:

1. "Digital Communications", J.S Chitode, Technical publication, Pune.
2. J. Proakis, "Digital Communications", McGraw Hill, 2000.
3. John M Senior, "Optical Fibre Communications – Principles and Practice", PHI. 2nd Edn,
4. KN. Hari Bhat and D Ganesh Rao, "Analog communication", 2nd Edn. Sangnine technical pub.
5. KN. Hari Bhat and D Ganesh Rao, "Digital communication", 3rd Edn. Sangnine technical pub.

EL 504: Embedded System Design

UNIT I

Microcontrollers: Types of microcontrollers, Microcontroller architectures, 8051 microcontroller register set, Instruction set and programming. Interfacing applications of 8051.

PIC Microcontrollers: overview and features of PIC 16C6X/7X, memory organization, Instructions, ports, interrupts. Industrial applications of Microcontrollers.

18 Hours

UNIT II

Embedded Systems: Embedded processor architectures and micro architectures(VLIW, EPIC, and SIMD overview), domain specific embedded processors, configurable/reconfigurable embedded systems, HW/SW computing architectures.

Signal processor: Coprocessor architecture, multiprocessor architectures, architectures for DSP and multimedia.

Embedded System Design: Constrained and optimized HW/SW system design, Behavioral description, Models and Implementation of basic HW and SW components, their interfaces, synthesis and code generation, Scheduling of access, Prediction and analysis of constrained and optimized design, Partitioning algorithms and tools, Design for testability considerations.

18 Hours

UNIT III

Reconfigurable Computing: FPGA Architectures, FPGA Design Cycle, Coarse-grained Reconfigurable Devices and Multi-FPGA Systems, Integration Platforms and IP core based architectures, FPGA embedded processors Reconfigurable Computing Applications in Image processing, Cryptography, Fault tolerant systems, etc.

14 Hours

Text Books:

1. K.J. Ayala, "The 8051 Microcontroller Architecture, Programming and Applications", Penram Int. Pub.
2. Rah Kamal, "Embedded system architecture, Programming and design", 2nd End, Tata Mc'Graw Hill.
3. Wayne Wolf, "Computers as Components: Principles of Embedded Computer Systems Design"
   Morgan Kaufmann.
4. Wayne Wolf, "FPGA based system design", Prentice Hall.

Reference Books:

1. G. Micheli, R.Ernst, and W.Wolf, "Readings in Hardware/Software Co-Design", Morgan Kaufman.
2. J.Staunstrup and W.Wolf, "Hardware/Software Co-Design Principles and Practice", Kluwer Academic.
3. Steve Kilts, "Advanced FPGA Design", Wiley Inter-Science.