Biju Patnaik University of Technology, Odisha B.E./B.Tech ECE Sem 5 syllabus

Microprocessors and Microcontrollers

Microprocessors and Microcontrollers

Module I: Introduction to 8 bit and 16 bit Microprocessors- H/W architecture: Introduction to microprocessor, computer and its organization, Programming system; Address bus, data bus and control bus, Tristate bus; clock generation; Connecting Microprocessor to I/O devices; Data transfer schemes; Architectural advancements of microprocessors. Introductory System design using microprocessors; 8086 – Hardware Architecture; External memory addressing; Bus cycles; some important Companion Chips; Maximum mode bus cycle; 8086 system configuration; Memory Interfacing; Minimum mode system configuration, Interrupt processing.

Module II: 16-bit microprocessor instruction set and assembly language programming: Programmer's model of 8086; operand types, operand addressing; assembler directives, instruction Set-Data transfer group, Arithmetic group, Logical group.

Module III: Microprocessor peripheral interfacing: Introduction; Generation of I/O ports; Programmable Peripheral Interface (PPI) - Intel 8255; Sample- and-Hold Circuit and Multiplexer; Keyboard and Display Interface; Keyboard and Display Controller (8279).

Module IV: 8-bit microcontroller- H/W architecture instruction set and programming: Introduction to 8051 Micro-Controllers, Architecture; Memory Organization; Special Function register; Port Operation; Memory Interfacing, I/O Interfacing; Programming 8051 resources, interrupts; Programmer's model of 8051; Operand types, Operand addressing; Data transfer instructions, Arithmetic instructions, Logic instructions, Control transfer instructions; Programming.

Module V: Maximum mode system configuration, Direct memory access, Interfacing of D- to-A converter, A-to-D converter, CRT Terminal Interface, Printer Interface, Programming of 8051 timers, 8051 serial interface. Introduction to 80386 and 80486 Microprocessor family.

Books:

[1] Microprocessor Architecture, Programming and application with 8085, R.S. Gaonkar, PRI Penram International publishing PVT. Ltd., 5th Edition
[2] Microprocessors and Interfacing, Programming and Hardware, Douglas V Hall, TMH Publication, 2006.
[3] Microprocessors and Interfacing, N. Senthil Kumar, M. Saravanan, S. Jeevananthan and S.K. Shah, Oxford University Press.
[4] The 8051 Microcontroller and Embedded Systems, Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D.M C Kinlay, Pearson Education, Second Edition, 2008.
[5] Microcontrollers: Principles and Application, Ajit Pal, PHI Publication
[6] Microprocessors and Microcontrollers Architecture, programming and system design using 8085, 8086, 8051 and 8096, Krishna Kant, PHI Publication, 2007.
[7] Advanced Microprocessors and Peripherals, A.K. Ray, K M Bhurchandi, TMH Publication, 2007.
[8] Textbook of Microprocessor and Microcontroller, Thyagarajan, Scitech Publication.

Digital Signal Processing

Digital Signal Processing

Module-I:

Discrete Time System: Basic Discrete Time Signals and their classifications, Discrete times systems and their classifications, Stability of discrete time system, Analysis and response (convolution sum) of discrete - time linear LTI system, Recursive and Non-recursive discrete time system, impulse response of LTI system, Correlation of discrete time Signal.

Module-II:

Z-Transform and Its Application to the Analysis of LTI Systems: Z-Transform, Direct Z-Transform, Properties of the Z- Transform, Inverse Z-Transform, Inversion Z-Transform by Power Series

Expansion, Inversion of the Z-Transform by Partial-Fraction Expansion, Analysis of Linear Time Invariant Systems in the z-Domain.

Module-III:
Discrete Fourier Transform: Frequency-Domain Sampling and Reconstruction of Discrete-Time Signals, Discrete Fourier Transform, DFT as a Linear Transformation, Relationship of DFT to other Transforms, Properties of DFT: Periodicity, Linearity, and Symmetry Properties, Multiplication of Two DFTs and Circular Convolution, Use of DFT in Linear Filtering, Filtering of Long Data Sequences. Efficient Computation of DFT: FFT Algorithms, Direct Computation of the DFT, Radix-2 FFT Algorithms, Decimation-In-Time (DIT), Decimation-In-Time (DIF).

Module-IV:
Structure and Implementation of FIR and IIR Filter: Structure for the Realization of Discrete-Time Systems, Structure of FIR Systems: Direct- Form Structure, Cascade-Form Structure, Frequency Sampling Structure, Design of FIR Filters: Symmetric and Antisymmetric FIR Filters, Design of Linear-Phase FIR Filters by using Windows, Design of Linear-Phase FIR Filters by Frequency Sampling Method. Structure for IIR Systems: Direct-Form Structure, Signal Flow Graphs and Transposed Structure, Cascade-Form Structure, Parallel-Form Structure. Design of IIR Filters.

Module-V:
Analog Filters: IIR Filter Design by Impulse Invariance, IIR Filter Design by the Bilinear Transformation. Basic adaptive filter: Structure of Adaptive FIR filter, System Modelling and Inverse Modeling, Matlab realization of DFT, FFT, Z-transform, IIR, FIR and adaptive filter.

Books:
[1] Digital Signal Processing – Principles, Algorithms and Applications by J. G. Proakis and D Manolakis, Pearson.
[2] Digital Signal Processing: Tarun Kumar Rawat, Oxford University Press.
[3] Digital Signal Processing – S. Salivahan, A. Vallavraj and C. Gnanapriya, Tata McGrawHill.
[4] Digital Signal Processing – Manson H. Hayes (Schaum’s Outlines) Adapted by Subrata Bhatt Tata McGraw Hill.
[5] Digital Signal Processing - Dr. Shalia D. Apte, Willey Publication

Control System

Control System

Module I: Industrial Control examples. Mathematical models of physical systems. Control hardware and their models. Transfer function models of linear time-invariant systems. Feedback Control: Open-Loop and Closed-loop systems. Benefits of Negative Feedback. Block diagram algebra. Signal Flow Graph and Mason's Gain formula.

Module II: Standard test signals. Time response of first and second order systems for standard test inputs. Application of initial and final value theorem. Design specifications for second- order systems based on the time-response. Concept of Stability. Routh-Hurwitz Criteria. Relative Stability analysis. Root-Locus technique. Construction of Root-loci.

Module III: Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion. Relative stability using Nyquist stability criterion – gain and phase margins. Closed-loop frequency response: Constant M Circle, Constant N Circle, Nichols Chart.

Module IV: Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems. Root-loci method of feedback controller design. Design specifications in frequency-domain. Frequency-domain methods of design. Application of Proportional, Integral and Derivative Controllers, Tuning of PID controllers, Lead and Lag and Lag-Lead compensator design.

Module V: Concepts of state variables. State space model. Diagonalization of State Matrix. Solution of state equations. Eigenvalues and Stability Analysis. Concept of controllability and observability. Pole-placement by state feedback. Discrete-time systems. Difference Equations. State-space models of linear discrete-time systems. Stability of linear discrete-time systems.

Books:
[1] I. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International, 2009.
[2] K. Ogata, "Modern Control Engineering", Prentice Hall, 1991
[3] M. Gopal, "Control Systems: Principles and Design", McGraw Hill Education, 1997.

[4] B. C. Kuo, “Automatic Control System”, Prentice Hall, 1995.

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