National Institute of Technology, RAIPUR

B.Tech. V-Semester **Branch: Electrical Engg**

Code: EL20511

Subject: DIGITAL SIGNAL PROCESSING
Minimum number of Class tests to be conducted: 2

UNIT- I

Basic elements of digital signal Processing –Concept of frequency in continuous time and discrete time signals –Sampling theorem –Discrete time signals. Discrete time systems –Analysis of Linear time invariant systems –Z transform –Convolution and correlation.

UNIT- II

Introduction to DFT – Efficient computation of DFT Properties of DFT – FFT algorithms – Radix-2 and Radix-4 FFT algorithms – Decimation in Time – Decimation in Frequency algorithms – Use of FFT algorithms in Linear Filtering and correlation.

UNIT- III

Structure of IIR – System Design of Discrete time IIR filter from continuous time filter – IIR filter design by Impulse Invariance. Bilinear transformation – Approximation derivatives – Design of IIR filter in the Frequency domain.

UNIT- IV

Symmetric & Anti-symmetric FIR filters – Linear phase filter – Windowing techniques rectangular, triangular, Blackman and Kaiser windows – Frequency sampling techniques Structure for FIR systems.

UNIT- V

Finite word length effects in FIR and IIR digital filters: Quantization, round off errors and overflow errors. Multi rate digital signal processing: Concepts, design of practical sampling rate converters, Decimators, interpolators. Polyphase decompositions. Application of DSP – Model of Speech Wave Form – Vocoder.

Text Books:

1. Oppenheim A V and Sehafer R W, “Discrete Time Signal Processing”, Prentice Hall (1989).
2. Proakis J G and Manolakis D G, “Digital Signal Processing”, Pearson Education India.

References:

1. Oppenheim A V, Willsky A S and Young I T, “Signal & Systems”, Prentice Hall, (1983).
2. Ifeachor and Jervis, “Digital Signal Processing”, Pearson Education India.
3. DeFatta D J, Lucas J G and Hodgkiss W S, “Digital Signal Processing”, J Wiley and Sons, Singapore, 1988.

National Institute of Technology, RAIPUR

B.Tech. V-Semester **Branch: Electrical Engg**

Code: EL 20512

Subject: Computer system Architecture

Minimum number of Class tests to be conducted: 2

Unit I: Processor Basics

(a) Register transfer and micro operations- Register transfer, bus and memory transfer, arithmetic micro operation and logic micro operation, shift micro operation, arithmetic logic shift unit, related examples.

(b) Computer organization and design- CPU organization, fundamental and features, Instruction codes, computer registers, computer instruction, timing and control, instruction cycle, memory reference instruction, input-output and interrupt, Design of basic computer.

Unit II: Addition and subtraction algorithms

(a) Data representation- Basic format, fixed and floating point representation :Addition and subtraction algorithm: addition and subtraction with signed magnitude data, addition and subtraction with signed 2's complement data (hardware implementation and hardware algorithm), carry save adder (CSA),

(b) Multiplication algorithms: Booths multiplication algorithm, Division algorithm, divide overflow algorithm

(c) Floating point arithmetic operations: addition, subtraction, multiplication, division algorithm and implementation. Decimal arithmetic unit and operations.

Unit III: Central processor unit design

(a) Basic concept, Micro programmed controls:- control memory, address sequencing, micro program example, design of control unit, hard-wired control

(b) Central processing unit: general register organization, stack organization, instruction format, addressing modes, data transfer and manipulation, program control, reduced instruction set, multiplier control unit.

(c) Pipeline and Vector processing: Parallel processing and pipelining; various pipelines e.g. arithmetic instructions, RISC, vector processing, Array processors.

Unit IV: Memory organization

(a) Hierarchical memory structure: memory hierarchy, optimization of memory hierarchy, main memory, addressing schemes of main memory, Auxiliary memory, associative memory, cache memory, virtual memory, memory management hardware.

(b) Memory allocation and management: classification of memory policies, optimal load control, memory management policies, memory management hardware.

National Institute of Technology, RAIPUR

B.Tech. V-Semester **Branch: Electrical Engg**

Subject: Computer system Architecture (continue….)

Unit V: System organization

(a) Input-output organization: Peripheral devices, input-output interface, asynchronous data transfer, modes of transfer, priority interrupt, I/O processor, serial communication, direct memory access(DMA),multiprocessors.

(b) Programming the basic computer: machine language, assembly language, assembler, program loops, programming arithmetic and logic operations and I/O programming.

Text Book:

1. “Computer system architecture “, M.M. Mano, TMH Publications.

Reference Books

1.”Computer Architecture and organization”, J.P.Hays, second edition Mc Graw Hill

2. “Computer organization and Architecture “, William Stallings, Prentice- Hall of India

3. “Computer organization “ ,Carl hamcher,Zvonko Vranesic & Safwataky,Mc Graw Hill

National Institute of Technology, RAIPUR

B.Tech. V-Semester **Branch: Electrical Engg**

Code: EL20513

Subject: Analog and Digital Communication

Minimum number of Class tests to be conducted: 2

UNIT I

Systems and Signal Analysis

Frequency domain representation of finite energy signals and periodic signals - energy spectral density and power spectral density - convolution theorem - response of linear time invariant system - sampling and reconstruction - Nyquist sampling theorem -Quantising of Analog Signals- random processes - ensemble and time averages - Stationarity - correlation theory for wide sense stationary processes - wiener-Khinchin-Einstein theorem - properties of Gaussian random processes - white noise - response of LTI system to white Gaussian noise

UNIT II

Analog Signal Transmission:

Amplitude modulation - spectrum - power relations - modulator and demodulator circuits - AM transmitter block diagram - tuned radio frequency and superheterodyne receivers - calculation of signal to noise ratio for envelope detection and coherent detection of AM - principle of single side band suppressed carrier modulation .

UNIT III

Analog Signal Transmission (cont...):

Frequency modulation - deviation - modulation index - spectrum of FM signal - relationship between phase modulation and FM - JFET reactance modulator - FM transmitter block diagram - foster Sceley discriminator - SNR calculation - pre-emphasis and de-emphasis

UNIT IV

Base band Data Transmission and Digital Carrier Modulation Schemes:

Analog modulation scheme - PAM - PWM - PPM - digital pulse modulation scheme - PCM - DPCM and delta modulation - base band data transmission - base band transmission model - additive white gaussian noise channel - matched filter receiver - inter symbol interference - basic ideas of pulse shaping - equalization - synchronization - scrambling and line coding - digital pass band transmission - elements of digital pass band transmission - pass band transmission model - coherent binary modulation schemes: ASK - PSK and FSK - multilevel signalling schemes - average probability of error - bit error rate - concept of an optimal receiver

UNIT V

Elements of information theory and Error Control Coding:

Measure of information - Shanon's source coding and channel coding theorems - discrete memoryless channel - Shanon-Hartley theorem - error control strategies - principles of forward error correction and ARQ - linear block codes and syndrome decoding - Binary Cyclic Codes - Burst Error Correcting Codes - Convolutional Codes - Performance of Codes.

Text books:

1) K. Sam Shanmugam.: .Digital and Analog Communication Systems., John Wiley and Sons,1985
2) Taub and Schilling: .Principles of Communication Systems., McGraw Hill, 1995
3) Simon Haykin: .An Introduction to Analog and Digital Communication Systems., John Wile & Sons , 1989.

Reference books:

1) Lathi B.P.: .Modern Digital and Analog Communication Systems., 3rd Edition, Oxford University Press, 1998.
2) Simon Haykin: .Communication Systems.
3) Andy Bateman: .Digital Communication: Design for The Real world., Addison Wesley, 1998.

National Institute of Technology, RAIPUR

B.Tech. V-Semester **Branch: Electrical Engg**

Code: EL20514

Subject: Power Electronics

Minimum number of Class tests to be conducted: 2

UNIT I
POWER ELECTRONICS DEVICES
Characteristics of power devices – characteristics of SCR, diac, triac, SCS, GTO, PUJT – power transistors – power FETs – LASCR – two transistor model of SCR – Protection of thyristors against over voltage – over current, dv/dt and di/dt.

UNIT II
TRIGGERING TECHNIQUES
Turn on circuits for SCR – triggering with single pulse and train of pulses – synchronizing with supply – triggering with microprocessor – forced commutation – different techniques – series and parallel operations of SCRs.

UNIT III
CONTROLLED RECTIFIERS
Converters – single phase – three phase – half controlled and fully controlled rectifiers – Waveforms of load voltage and line current under constant load current – effect of transformer leakage inductance – dual converter.

UNIT IV
INVERTERS
Voltage and current source inverters, resonant, Series inverter, PWM inverter. AC and DC choppers – DC to DC converters – Buck, boost and buck – boost.

UNIT V
INDUSTRIAL APPLICATIONS
DC motor drives – Induction and synchronous motor drives – switched reluctance and brushless motor drives – Battery charger – SMPS – UPS – induction and dielectric heating.

TEXT BOOKS

1. Muhamed H.Rashid : Power Electronics Circuits, Devices and Applications, 3rd Edn. 2004 PHI.
2. Singh and Kanchandani : Power Electronics, TMH, 1998.

REFERENCES

1. Sen : Power Electronics, TMH, 1987.
2. Dubey : Thyristorised power controllers, Wiley Eastern 1986.
3. Vithayathil : Power Electronics – Principles and applications McGraw-Hill, 1995.
4. Lander : Power Electronics, 3rd Edition, McGraw-Hill, 1994.

National Institute of Technology, RAIPUR

B.Tech. V-Semester **Branch: Electrical Engg**

Code: EL20515

Subject: Analog Electronics

Minimum number of Class tests to be conducted: 2

UNIT I:

Transients at high frequency

The hybrid π common emitter transistor model, hybrid n-conductance, hybrid π -capacitance, CE short circuit gain with resistive load, the gain bandwidth product, emitter follower at high frequency.

UNIT II:

Large Scale Analysis

Class-A large signal amplifiers, harmonic distortion, higher order harmonic generation, transformer coupled audio power amplifier, efficiency, push-pull amplifier, class-B amplifiers, and class-AB operation.

UNIT III:

Multistage Amplifier

Classification of amplifier, distortion in amplifier frequency, response of an amplifier, low frequency response of RC coupled amplifier, band pass of cascaded stage, high frequency response of two cascaded CE transistor stages, multistage CE amplifier, High frequency response of two cascaded CE transistor stages, Darlington configuration.

UNIT IV:

Operational Amplifier

Operational amplifier architecture, basic operational amplifier, inverting operational amplifier, non inverting operational amplifier, differential amplifier, offset error voltage and current, measurement of amplifier parameters, CMRR, slewing rate, basic operational amplifier applications, differential DC bridge amplifier.

UNIT V:

Integrated Circuit Fabrication

Overview of IC Technology, unit steps used in IC fabrication, wafer cleaning, photolithiography, wet and dry itching, oxidation, diffusion, ion-implantation techniques for deposition of poly-silicon, silicon, silicon pnitride and silicon dioxide, metallization and passivation.

Text Books:

1. "*Electronic Circuit Discrete And Integrated*", Belove, PHI Pbs.
2. "*Integrated Electronics*", Millman and Halkias, PHI Pbs.

Reference Books:

1. "*Microelectronics*", Millman, Wiely Pbs.

National Institute of Technology, RAIPUR

B.Tech. V-Semester **Branch: Electrical Engg**

Code: EL20516

Subject: Control Systems Engineering
Minimum number of Class tests to be conducted: 2

UNIT I

General Control Systems: Introduction, open- and closed-loop control, Transfer function, Mathematical modelling of various physical systems, e.g., electrical, mechanical, hydraulic, pneumatic, thermal, etc., feedback and feed-forward control systems.

(a) Block diagrams and reduction techniques.
(b) Signal flow-graph analysis.

UNIT II

Time Domain Analysis & Design: Steady-state and transient analysis of first and second order systems, steady-state errors, error constants, performance specifications in time domain, Types of feedback control system,Proportional Integral and derivative control, PID controller, Design specifications and considerations of second-order systems, Performance indices.

UNIT III

Stability and frequency Domain Analysis: Stability: concept, necessary conditions, Routh-Hurwitz stability criterion, relative stability analysis.

(a) Polar plots, Bode plots, Experimental determination of transfer function, Design considerations.
(b) Stability in frequency domain: Hurwtiz stability criterion and Relative stability assessment, Gain Margin and Phase Margin, Systems with transportation lag, Closed-loop frequency response, Nichol's chart, Sensitivity analysis in frequency domain.

UNIT IV

Design using Root Locus: Root locus plots, Rules for constructing Root loci, Root locus analysis with and without transportation lag, Root contour plots.

(a) Compensation using root locus: Cascade lag, cascade lead, cascade lag-lead network.
(b) Compensation using Bode plots: Lag, lead and lag-lead networks.

UNIT V

State variable Analysis: Concepts of state and state variable, System dynamics representation by differential equations, state equations and transfer functions.

(a) Eigan values and their invariance, Eigen Vectors, Diagonalization, Similarity transformations, Transfer function decomposition.
(b) Cayley-Hamilton theorem, Computation of state transition matrix by different methods, Solution of state equations, controllability and observability.

Books: Text:

(1) "Automatic Control System" by B.C. Kau, PHI.
(2) "Modern Control Engineering" by Ogata, PHI.

Reference Books: (1) "Control System Engineering" by Nagarath & Gopal,
(2) "Control System: Principle & Design", by M.Gopal,TM.