CONTROL SYSTEMS (304181)

Teaching Scheme **Examination Scheme**
Lectures / Week: 3 Hrs **Paper: 100 Marks**

Unit I: Introduction **(6 Hours)**

Definition of control system, Open loop and Closed loop, Feedback and Feed-Forward control, The Design process (with a case study)
Mathematical modeling of a physical system: Differential equations of a physical system, Laplace transforms, and concept of transfer function
Block Diagram Algebra, Signal flow graph – Mason's Gain formula

Unit II: Time Domain Analysis and Design **(6 Hours)**

Standard test inputs, Time response of first order and second order systems, Steady state analysis: steady state error and error constants, transient response specifications.
Stability analysis – Routh-Hurwitz criterion. Root Locus technique, Design of compensators using Root Locus.

Unit III: Frequency Domain Analysis and Design **(6 Hours)**

Correlation between time and frequency response, frequency domain specifications, Nyquist plots, Bode plots – gain margin, phase margin, design of lead/lag compensators using Bode plots.

Unit IV: State Variable Analysis and Design **(6 Hours)**

Concept of state, state variables and state model, State models for continuous time systems (SISO, MIMO) – derivation of transfer function from state models and vice versa, Solution of state equations – state transition matrix, Controllability and Observability, State feedback controller using pole placement, Observers.

Unit V: Controllers **(6 Hours)**

PID Controllers: basic algorithm, structures, practical modifications – ISA PID control law, discrete implementation
Programmable Logic Controller (PLC) – Concept, Architecture, Programming and Interfacing, Application case studies.

Unit VI: Advances in Control **(6 Hours)**

Digital Control, SCADA, Distributed Control System, Adaptive Control – Gain Scheduling, MRAS and Self Tuning, Feedback Linearization Control, Predictive Control, Optimal Control, Robust Control. Application case studies in Motion Control, Process Control, Automotive Control, Aircraft and Missile Guidance & Control.

Text Books:

1. Nagrath I. J. and M. Gopal, "Control Systems Engineering", 5th Ed. New Age International.
2. Norman S. Nise, "Control System Engineering", 5th Edition, Wiley.

Reference Books:

1. Ogata Katsuhiko, “Modern Control Engineering”, 4th Edition, PHI.
2. Curtis D. Johnson, “Process Control Instrumentation Technology”, 8th Edition, PHI.
3. William S. Levine, “The Control Handbook”, CRC – IEEE Press.
4. Les Frnical, “Control System”, CENGAGE Learning, India.

DIGITAL COMMUNICATION (304182)

Teaching Scheme **Examination Scheme**

Lectures / Week: 4 Hrs **Paper: 100 Marks**

Practical /Week: 2Hrs. **Practical: 50 Marks**

Unit I: Digital Baseband Modulation Techniques and Waveform Coding Techniques

(7 Hours)

Base band system, Formatting textual data, messages, characters & symbols, Formatting analog information, Sources of corruption, PCM, Uniform and Non uniform quantization, Baseband modulation, Noise consideration in PCM systems, , DPCM, DM,ADM, LPC.

Unit II: Baseband Demodulation Detection Techniques **(7 Hours)**

Signals & noise, Data formats, synchronization and multiplexing, Intersymbol interference, Equalization, Detection of binary signals in presence of Gaussian noise, Matched and optimum filters.

Unit III: Random Process **(8 Hours)**

Introduction, Mathematical definition of a random process, stationary processes, mean, correlation & covariance function, Ergodic processes, transmission of a random process through a LTI filter, Power spectral density, Gaussian process, noise, narrow band noise, representation of narrowband noise in terms of in phase & quadrature components, representation of narrowband noise

Unit IV: Digital Bandpass Modulation Technique **(8 Hours)**

Digital band pass modulation techniques, detection of signals in Gaussian noise, coherent detection, non coherent detection, complex envelope

Unit V: Detection and Performance Analysis of Bandpass Signals (7 Hours)

Error performance for binary systems, M-ary signaling & performance, symbol error performance for M-ary systems for M= 2,4,8,16.

Unit VI: Spread Spectrum Techniques (8 Hours)

Spread spectrum techniques: Introduction, pseudo noise sequences, a notion of spread spectrum, direct sequence spread spectrum with coherent BPSK, Signal space dimensionality & processing gain, probability of error, frequency hop spread spectrum

Multiuser radio communication: Multi access techniques, satellite communication, radio link analysis, wireless communication, statistical characterization of multipath channels, binary signaling over a Rayleigh fading channel, TDMA & CDMA wireless communication systems, source coding of speech for wireless communication, adaptive antenna arrays for wireless communication

Text Books:

1. Bernard Sklar, "Digital Communications fundamentals and Applications" Second Edition. , Pearson Education
2. Simon Haykin "Communication Systems" Fourth Edition , John Wiley& sons

Reference Books:

1. A.B Carlson, "Principles of communication systems", Third Edition, TMH.
2. Taub Schilling, "Principles of Communication system", Fourth Edition, TMH.
3. John G. Proakis, Masoud Salehi, Gerhard Bauch, "Contemporary Communication System using MATLAB", Cengage learning.

List of Practicals:

1. Verification of sampling theorem.
2. Study of PCM with uniform & nonuniform quantization, SNR measurement for PCM system with uniform quantization.
3. Study of DM & ADM systems.
4. Generation & reception of BPSK & its spectral analysis (DSO).
5. Generation & reception of FSK & its spectral analysis (DSO).
6. Generation & reception of QPSK & its spectral analysis (DSO).
7. Spectral analysis of line codes.
8. Detection of digital baseband signal using matched filter in the presence of noise
9. Generation & detection of DS-SS BPSK.
10. Simulation of any digital communication system using COMPSIM/MATLAB®.

NETWORK SYNTHESIS AND FILTER DESIGN (304183)

Teaching Scheme
Lectures / Week: 3 Hrs
Practical /Week: 2Hrs.

Examination Scheme
Paper: 100 Marks
Termwork:50 Marks

Unit I: Network Functions & Fundamentals of Network Synthesis (5 Hours)

Network functions, properties of all types of network functions, Effect of poles and zeros on the system function, network synthesis problems, elements of reliability, causality and stability, Hurwitz's polynomial, Positive real function testing, elementary synthesis procedures.

Unit II: Synthesis of One Port Networks (6 Hours)

Properties of RC, RL and LC driving point functions and their synthesis in Foster and Cauer forms. Synthesis of RLC driving point functions in terms of partial fraction and continued fractions for simple driving point functions.

Unit III: Synthesis of Transfer Functions (6 Hours)

Properties of transfer function, zeros of transmission, synthesis of Y21 and Z21 with 1ohm termination. Synthesis of voltage transfer functions using constant resistance networks. Synthesis of open circuit transfer function (Ladder development).

Unit IV: Passive Filter Design (7 Hours)

Introduction to various approximation techniques, Butterworth and Chebyshev approximation, derivation of normalized low pass filter transfer function upto 3^{rd} order by Butterworth approximation from basic principles. Evaluation of transfer function for Chebyshev filters from pole zero plots. Synthesis of above mentioned filters with 1ohm termination. Frequency transformation to high pass, band pass and band stop forms. Normalized low pass filters, frequency scaling and Impedance scaling.

Unit V: Active Filter Design (6 Hours)

Factored forms of the functions, cascade approach, Biquad topologies: positive and negative feedback topology, coefficient matching techniques for obtaining element values. Sallen Key low pass circuits. RC to CR transformations for high pass filter design of Sallen Key band pass circuit. Substitution of passive elements by FDNR, Gyrator and GIC.

Unit VI : Sensitivity and Performance Parameters (6 Hours)

Definition of sensitivities. Sensitivity analysis of the above circuits with respect to parameters like Q, ω_o and component values. Multi-element deviation, Gain sensitivity. Factors affecting gain sensitivity, Contribution of the approximation functions, choice of the circuit and component types.

OP-AMP frequency characteristics and compensation techniques, Effect of Op-amp frequency characteristics on filter performance and other op-amp characteristics like Dynamic range, slew rate, offset voltage and currents, noise, common mode signals.

Text Books:

1. Franklin Kuo, "Network Analysis and Synthesis", Wiley international.
2. Gobind Daryanani, "Principles of Active Network Synthesis and Design", Wiley International.

Reference Books:

1. M.E. Van Valkenberg, "Analog Filter Design", Harcourt Brace Jovanovich College Publishers.
2. Wai-Kai Chen , "Passive and Active Filters, theory and implementations", Wiley international
3. Lawrence Huelsman, "Active and Passive Analog Filter Design", McGraw-Hill Inc.

List of Practicals:

(Minimum 3 practicals to be performed using software like MultiSim®)

1. For two port LC network, find all network functions and sketch plot poles and zeros.
2. To carry out synthesis of one port LC network into any of the Canonical forms and verify practically.
3. To synthesize given transfer function into constant resistance network (Bridge T or Lattice) and verify practically.
4. Design a Butterworth low/high pass filter Sallen Key circuit and verify (at least 2^{nd} order).
5. Design a Chebyshev low/high pass filter Sallen Key circuit and verify (at least 2^{nd} order).
6. To find gain of biquad op amp circuit & study sensitivity of gain against the different components.
7. To study effect of op amp characteristics on filter performance and compensation techniques for the same at least one parameter to be studied practically.
8. Design build and test a simple audio equalizer using filter concepts.

MICROCONTROLLERS AND APPLICATIONS (304184)

Teaching Scheme
Lectures / Week: 3 Hrs
Practical /Week: 2 Hrs.

Examination Scheme
Paper: 100 Marks
Practical: 50 Marks

Unit I: Introduction to Microcontrollers **(3 Hours)**

Microprocessors and Microcontrollers, CISC and RISC Processors, Harvard and Von Neumann Architectures, Architecture of a Microcontroller, Family members, Microcontroller resources, Resources in Advanced and Next Generation Microcontrollers.

Unit II: 8051 Architecture **(6 Hours)**

MCS-51 architecture, Pin description, Internal and external memories, timing diagrams for memory interfacing, Counters and Timers, Serial communication, Stack and Stack Pointer, Port Structure and Interrupts.

Unit III: MCS-51 Addressing modes and Instructions **(7 Hours)**

8051 Addressing modes, MCS-51 Instruction set, Microcontroller Application Development tools- Simulator, Emulator, In-circuit Emulator (ICE), Logic Analyzer, ISP, Cross assembler, Embedded C.

Unit IV: Serial and Parallel Port Interfacing **(8 Hours)**

RS 232, RS 485, I^2C bus standard, Interfacing ADC, DAC, memory, RTC with 8051/89C51 using I^2C bus.

Interfacing 8051/89C51 to LED with and without interrupt, ADC, DAC, LCD and keypad (consider debounce), Stepper motor, SPI bus.

Unit V: PIC Microcontroller **(6 Hours)**

Introduction to PIC architecture 18FXX series, Programming PIC in C

Unit VI: System Design **(6 Hours)**

Case Study- system design using 8051/89C51/PIC microcontrollers - General Data Acquisition system, TCP-IP based application, Robot development.

Text Books:

1. Muhammas Mazidi, Janice Mazidi and Rolin McKinlay, 'The 8051 Microcontroller and Embedded Systems using Assembly and C', Pearson Education, 2nd edition.
2. Kenneth J. Ayala, 'The 8051 Microcontroller', Cengage Learning.
3. Mazidi, Rolin McKinlay and Danny Causey, 'PIC Microcontroller and Embedded Systems using Assembly and C for PIC18', Pearson Education.

Reference Books:

1. Myke Predko, 'Programming and customizing the 8051 microcontroller', TATA McGraw Hill.
2. Ajay Deshmukh, 'Microcontrollers Theory and Applications', TATA McGraw Hill.
3. Subrata Ghoshal, 'Embedded Systems and Robots- Projects using the 8051 Microcontroller', Cengage Learning.

List of Practicals:

1. Programming of 8051on simulator (simple programs)
2. Programming of 8051on simulator (complex programs)
3. LED interfacing with 8951 using timer with interrupt
4. LCD and keypad interfacing with 8951 using assembly and C in 4 bit and 8 bit mode
5. ADC interfacing using I^2C bus with 8951/PIC 18FXX
6. DAC interfacing using I^2C bus with 8951/PIC 18FXX
7. Stepper motor interfacing with 8951/PIC 18FXX
8. Serial communication using RS 232 using serial port of 8951 with and without interrupt
9. Case Study – I*
10. Case Study – II*

* Any two designs specified in Unit 6 should be implemented and tested using any microcontroller

DIGITAL SIGNAL PROCESSING (304185)

Teaching Scheme	Examination Scheme
Lectures/Week: 4 Hrs	**Paper: 100 Marks**
Practicals/Week: 2Hrs	**Oral: 50 Marks**

Unit I: Characterization of LTIDT System (8 Hours)

Basic elements of DSP system, advantages of DSP over analog processing, Sampling theorem, practical sampling, aliasing.

Time Domain Analysis of DT System: Difference equations, Recursive solution of difference equation, zero input response, unit impulse response, system response to external input, convolution sum, total response of DT system, causal LTIDT system stability.

Systems with Finite Duration and Infinite Duration Impulse response, structures for the realization of LTIDT systems, Direct form I & II.

Unit II: Fourier Analysis of DT System (6 Hours)

DTFS & DTFT, Power & Energy density of periodic and aperiodic signals, computation of DTFT, DFT , properties of DFT, FFT, DIT, DIF..

Unit III: DT System Analysis Using Z- Transform (8 Hours)

Need of Z – transform, Definition, Inverse, properties, Z-Transform solution of difference equations, Connection between DTFT and Z-Transform, System Stability and Z-Transform, classification of system using pole zero plot.

Unit IV: Digital Filters (8 Hours)

Realization of digital filter, Causality & its implications, Time domain equivalence criterion, IIR design by impulse invariance method, bilinear transformation, FIR design

Linear phase conditions, time domain equivalence method, frequency sampling method.

Unit V: Multirate Sampling **(8 Hours)**

Introduction, Decimation, Interpolation, sampling rate conversion, polyphase implementation of filter.

Applications: DAC in compact Hi-Fi Systems, Acquisition of High quality data, Multirate narroband digital filtering , Hi resolution narrow band spectral analysis.

Unit VI: DSP Hardware Platform **(8 Hours)**

Introduction, Difference between Microprocessor and DSPs, General Architecture of DSPs.

Case Study of TMS320C67XX, Speech processing, Interpolation and Decimation implementation , Convolution Sum.

Text Books:

1. John G.Proakis, D.G.Manolakis, “Digital Signal Processing”, Pearson Prentice Hall.
2. Emmanuel C, Ifeachor , B.W.Jervis, “Digital Signal Processing”, Academic Press.

Reference Books:

1. B.P. Lathi, “Signal Processing and Linear Systems”, Oxford University Press.
2. S.K. Mitra, “Digital Signal Processing Computer Based Approach”, TMH.
3. B.Venkataramani, M. Bhaskar, “Digital Signal Processors”, Architecture programming & applications, TMH.
4. Avtar Singh, “Digital Signal Processor”, Cengage Learning.
5. TEXAS DSP Manual.

List of Practicals: Software platform: C++/MATLAB®

Minimum 12 practical, out of following 15 practicals including at least two practicals on filters, one on multirate sampling and one on DSP Hardware Platform.

1. To find total response of DT system described by the difference equation.
2. To study sampling theorem and aliasing.
3. To find DTFS for periodic and DTFT for non periodic signal.
4. To find DFT of DT signal.
5. To find the response of DT system using convolution.
6. To find the stability of DT system using the concept of convolution.
7. To perform convolution using overlap and add method.
8. To find Z and inverse Z transform and draw sketch pole zero plot of Z-domain transfer function.
9. To solve the difference equation and find the system response using Z transform.
10. To find the impulse invariance IIR digital filter to realize the first order analog

    Butterworth filter.

11. To design IIR filter for first order analog Butterworth approximation using bilinear

    transformation.

12. To find and plot the frequency response for the rectangular and Hamming window.

13. To Design FIR filter using frequency sampling method.

14. To study interpolation and decimation.

15. To implement any two of the following applications using DSPs.

i) Convolution Sum ii) Speech processing iii) Interpolation and Decimation .

ELECTRONIC DESIGN PRACTICE (304186)

Teaching Scheme
Lectures / Week: 1 Hrs
Practical /Week: 2Hrs

Examination Scheme
Oral: 50 Marks

---

1) Design of Linear Regulated Power Supply:

Assignment of Linear Power Supplies for Laboratory use should be selected from any one type given below:

1) Dual Tracking.

2) Multiple Outputs CV-CC Modes.

Scope of Design:-

a) Design of Transformer.
b) Proper selection of Rectifier and its appropriate rating.
c) Filter Design and Proper selection of Filter component with rating.
d) Justified selection and Design of Regulator Circuit.
e) Current boosting using external pass/parallel transistor.
f) Over current/ Short-circuit, Over voltage, Thermal Protection.
g) Indication of V, I and mode of operation on Panel by Meter or Display.
h) Indicators for Over Voltage, Over Current.
i) Input Power considerations and Protection circuit like EMI Filters, Fuses, MCB.
j) Thermal considerations- Heat Sink calculations.
k) Enclosure Design.
l) Component List in the form of Bill of Material.
m) Performance Analysis.

2) FSM / ASM Based Digital Design.

Assignment should be based upon real life problems like Traffic Light Control, Elevator Control, Vending Machine, Lift Control etc.

Scope of Design:-

a) Selection of State Machines: - Moore and Mealy Machines.
b) State Table and State Diagram.
c) Implementation of Combinational Logic Design in State Machine using MSI, LSI Devices like Multiplexers, Decoders, ROM's, PLD's

d) Fuse Map generation techniques, Design using PAL/PLA.
e) ASM technique includes: - Justified Algorithm and ASM Chart.
f) Representation using Simplified Block diagram.
g) Justified selection of digital circuit for each block.
h) List of digital IC's with their Logic Family Specifications and Features.

3) Data Acquisition System.

Assignment should be based on Specific Industrial Application. It should have at least Two Channel inputs.

Scope of Design:-

a) Selection of appropriate Signal Sensing Schemes.
b) Design of signal conditioning circuits.
c) Signal conditioning may consists of V to F, F to V, Chopper Amplifier etc.
d) Selection of suitable A to D Converter.
e) Selection of Micro-controller with appropriate Interfacing circuit.
f) Output Interfacing such as V/I, Relay, RS 485, Fiber Optic Link.
g) Indication of Parameters using Analog Meter, LED/LCD Display,
a) Alphanumeric DPM **(**Use Simple scheme and one type of indication only).
h) System should include circuits such as RMS to DC Converter, PLL,
b) Log-Amplifier, Programmable Gain Amplifier, Multiplier/Divider,
c) Balanced Mixer, Error-Amplifier as and when required.
i) Component List in the form of Bill of Material.

4) Audio Amplifier System Design.

Assignment should be based on at least three source signals with all possible features considering the latest Audio Amplifier Systems. It should be specified with Power Output (Maximum 100 watt), Speaker Load resistance (Maximum 100 Ohm) and Number of Graphic Equalizer Bands (Maximum 7 bands).

Scope of Design: -

a) Sources of signals like Microphone, CD, Tape-head Auxiliary Input.
b) Design of source signal conditioning.
c) Equalization Design of front end High Input Impedance stage.
d) Pre driver and appropriate Power Amplifier Configuration Design
e) Special Features like Volume Control & Tone Control Design.
f) Sound Level Indication by Bar Graph Display.
g) Considerations of Performance Parameters like Distortion, Hum & Noise.
h) Considerations of short circuit protection. Consideration of SOA.
i) Selection of required Power Supply for the system.
j) Facility to support Battery operation.
k) Justified selection of IC's or Transistors.
l) Enclosure Design.
m) Component List in the form of Bill of Material.
n) Performance Analysis.

References:

Data and Application Manuals and Application Notes from:

1) RS Component Catalog.
2) National Semiconductor regulator design manual.
3) Analog Devices Data Manual.
4) Motorola, “Linear / Switch mode power supplies”.
5) Motorola Power Transistors & Thyristors data hand book.
6) Philips Audio Data Manual.
7) BEL Transistor Manual
8) Tower’s Data Manual.
9) “PIC 16XX data book.”
10) Texas instruments, “Linear interface and applications circuit design”
11) CEDT References.
12) “ATMEL micro controller data book.”
13) Intel Peripheral Manual.

Reference Books:

1) Paul Horowitz, “Art of Electronics”.
2) B.S.Sonde, “Power Supplies”.
3) B.S.Sonde, “System Design Using Integrated circuits”.
4) Hill and Peterson, “Digital System Design”.
5) Franklin P. Prosser, David E. Winkel, “The art of digital design”, (PHI).
6) Fletcher, “Introduction to digital design”.
7) Tubay Grame & Huelsmann (student Edition-Burr Brown), “Operational amplifiers”
8) Sergio Franco, “Design with Operational amplifiers and analog Integrated circuits”, (3rd edition-TMH).
9) Peatman, “Micro controller system design”.
10) Gotlib, “Power Supply Design”.
11) Palls-Areny, “Analog Signal Processing”.
12) Handbook on Sound Engineering.
13) Charles H. Roth Jr., “Fundamentals of Logic design”, Fourth Edition, Jaico Book.

Web References:

1) www. Alldatasheets.com
2) www. national.com (use free power supply design tool from National Semiconductor website and design a multi output voltage SMPS using this tool).
3) www.microchip.com
4) www.atmel.com/products
5) www.8051_hw.com
6) www.8052.com
7) www.ti.com

SIGNAL CODING AND ESTIMATION THEORY (304187)

Teaching Scheme
Lectures / Week: 4 Hrs
Practical /Week : 2Hrs.

Examination Scheme
Paper: 100 Marks
Practical: 50 Marks

Unit I: Information Theory and Source Coding (7 Hours)

Introduction, Uncertainty, Information and Entropy, Source coding theorem,

Huffman , Shanon Fano , Arithmetic , Adaptive coding , RLE , LZW Data compaction, , LZ-77, LZ-78 Discrete Memory less channels, Mutual information, channel capacity, Channel coding theorem, Differential entropy and mutual information for continuous ensembles

Unit II: Channel Coding (6 Hours)

Information, Capacity theorem, Implication of the information capacity theorem, Information capacity of colored noise channel, Data compression : JPEG , DCT , Introduction to Wavelet Error Control Coding: (Linear Coding) Error Coding Introduction , Decoding , Circuit Implementation , Error Probability of **:** LBC, Cyclic, CRC (Except Error probability) .Perfect Code , Error Coding Techniques **:**Fire Code, Golay Code, Hamming codes,

Unit III: Convolution Codes and Coding methods (8 Hours)

Introduction to convolution codes, Tree codes and trellis codes, Polynomial description of convolution codes, distance notions for convolution codes, Distance Notation The generating functions, Matrix description of convolution codes, Vterbi decoding of convolution codes, Distance bounds for convolution codes, Performance bounds, Known good convolution codes, Turbo codes, decoding, Introduction to TCM, Concept of coded modulation, Mapping by set partitioning, Ungerboeck's TCM design rules, TCM decoder, FEC and ARQ systems , Performance of all codes.& Computation of Dfree.

Unit IV: Application of Information Theory (8 Hours)

Group , Field , Vector , GF addition , multiplication rules. Introduction to BCH codes, Primitive elements, Minimal polynomials, Generator polynomials in terms of Minimal polynomials, Some examples of BCH codes,& Decoder, Reed- Solomon codes & Decoder, Implementation of Reed Solomon encoders and decoders,

Data compression: Introduction to data compressions

Introduction to Cryptography: DES, AES Algorithm, Overview of Encryption Techniques, RSA algorithm,

Unit V: Estimation Theory **(8 Hours)**

Maximum Likelihood estimation (MLE): exact and approximate methods (EM, alternating max, etc)

Cramer-Rao lower bound (CRLB) Minimum variance unbiased estimation, best linear unbiased estimation Bayesian inference & Least Squares Estimation Basic ideas, adaptive techniques, Recursive LS, etc Kalman filtering (sequential Bayes)

Unit VI: Detection Theory **(7 Hours)**

Likelihood Ratio testing, Bayes detectors, Minimax detectors,

Multiple hypothesis tests Neyman-Pearson detectors (matched filter, estimator-correlator etc), Generalized likelihood ratio tests (GLRTs) Applications

Text Books:

1. Simon Haykin ," Communication Systems" , 3E
2. Khalid Sayood ," Introduction to Data Compression" , Morgan Kaufmann Publishers

Reference Books:

1. David Soloman , "Data Compression", Springer
2. Ranjan Bose, "Information Theory coding and Cryptography" ,TMH.
3. Bernard Sklar, "Digital Communication-Fundamentals & Application" ,Pearson Education: 2nd Edition.
4. J. G. Proakis, "Digital Communication", MGH International: 4th Edition.
5. Heinrich Mery, Marc Moeneclary, Stefan A. Fechtel, "Digital Communication Receivers Synchronization , Channel Estimation and Signal Processing" , Wiley Publication
6. S.M. Kay, "Fundamentals of Statistical Signal Processing: Detection Theory", Vol. 1, 2.

List of Practicals :

1) Implementation of algorithms for determination of various entropies and mutual information of a given channel. Test various types of channel such as
   a) Noise free channel.
   b) Error free channel
   c) Binary symmetric channel
   d) Noisy channel
2) Implementation of algorithm for generation and evaluation of variable length source coding using
   a) Shannon – Fano coding
   b) Huffman Coding
   c) Decoder for any one of the above
3) Implementation of algorithms for generating and decoding linear block codes.
4) Implementation of algorithms for (7,4) generating and decoding of cyclic code
5) Implementation of algorithms for generating convolution codes using
   a) Code Tree
   b) Code Trellis
6) Implementation of algorithms for decoding convolution codes using Viterbi's algorithm.
7) Implementation of algorithms for decoding of BCH algorithm.
8) Case Study of : Digital Video Broadcasting or Digital Phase Lock Loop or RS Coding & Decoding

SYSTEM PROGRAMMING AND OPERATING SYSTEMS (304188)

Teaching Scheme
Lectures / Week: 3 Hrs
Practical /Week: 2Hrs.

Examination Scheme
Paper: 100 Marks
Term work: 50 Marks

Unit I: Basics of system programming (6 Hours)

Language processors: Language processing activities, Fundamentals of language processing, Fundamentals of language specification, Language processor development tools.
Data structures for language processing: Search data structure, Allocation data structures.
Scanning and parsing, Assembler: Assembly language programming, simple assembly scheme, pass structure of assembler, design of two pass assembler

Unit II: Macro processor, Compliers and Interpreters (6 Hours)

Macro definition and call, macro expansion, Machine Independent macro processor features, Nested macro calls, advanced macro facilities, Design of macro preprocessor.
Basic compliers function, Phases of compilation, memory allocation, compilation of expression, compilation of expressions, compilation of control structures, code of optimization, interpreter.

Unit III: Linkers and Loaders and Software tools (6 Hours)

Basic loaders functions, central loaders scheme Absolute loaders, Subroutine linkers, relocation Loader, Direct linking loader, Dynamic linking loader, Design of absolute loaders direct linking loader,
Implantation of MS DOS linker,
Software tools for program development, editors, debug monitor, programming environment, user interfaces.

Unit IV: Introduction to Operating System, Process and threads and Deadlocks (6 Hours)

Evolution of O. S. Function, various OS, OS concepts, OS structure
Processes, threads, inter process communication, IPC problems, scheduling
Resources, introduction to deadlock, ostrich algorithm, deadlock detection and recovery, avoidance, prevention, other aspects

Unit V: Memory management (6 Hours)

Basics of memory management, Swapping, Virtual memory, Page replacement algorithm, FIFO, second chance PR, clock PR, least recently used, working set PR, WS clock PR, Design issues for Paging systems, OS involvement with paging, page fault handling, Segmentation

Unit VI: Input and Output, File system **(6 Hours)**

Review of computer hardware, principles of I/O hardware, principles of I/O software, I/O software layers, disks, clocks, graphical user interface, network terminal, power management
Files, directories, file system and implementation, file system layout, implementing files, implementing directories, shared files, disc space management, examples of file system: CDROM, MSDOS, Win98, Unix

Text Books:

1. D. M. Dhamdhare, "Systems Programming and Operating System", TMH.
2. Andrew S. Tanenbaum, "Modern Operating Systems", Second Edition, PHI.

Reference Books:

1. J. J. Donovan, "Systems Programming", McGraw Hill.
2. Siberschatz A; Galvin P.B; Gagne G, "Operating System Concepts", John Wiley.
3. Leland L. Beck, "System Software," Pearson Editions.

List of Practicals

1. a Write C Program to implement Lexical Analyzer for simple arithmetic operation. Involving equal to E) P arithmetic operators (+,-) Expected O/P to Create:

   1. Identifier Table 2.Literal Table 3.Symbol Table 4.Uniform Symbol Table

1. b To implement simple arithmetic operation using Lexical analyzer and compiler using LEX and YACC

2. Design of PASS I of two pass assembler for a subset of 8086

3. Design of a MACRO PASS-I

4. Design of a MACRO PASS-II

5. Implement Job scheduling algorithms:

   1. FIFO 2. Shortest Path First 3. Round Robin

6. Bankers Algorithm for deadlock detection and avoidance

7. Implementation page replacement algorithm :

   1. FIFO 2. LRO

8. Write an interactive shell program on UNIX / LINUX

9. Case Study:

   A. UNIX/LINUX/WIN 2000
   B. Device drivers

COMPUTER ORGANIZATION AND ARCHITECTURE (304189)

Teaching Scheme: **Examination Scheme :**

Lectures: 4 hrs / week **Theory: 100 Marks**

Unit I: Computer Architecture and Arithmetic **(7 Hours)**

Computer Architecture, Von Neumann Architecture, Functional Units, Basic Operational Concepts, Performance, Processor organization, Bus Structure, Register Organization, Instructions and Instruction Sequencing, Addressing Modes;

Arithmetic: Multiplication of positive numbers, Signed Operand Multiplication, Booths Algorithm, Fast multiplication, Integer Division, Floating point Numbers and Operations, IEEE standards, Floating point arithmetic.

Unit II: The Central Processing Unit **(7 Hours)**

Basic Processing Unit: Single Bus Organization, Register Transfer, Performing an arithmetic or logic operation, Fetching and storing word from/to memory, Execution of complete instruction, branch instruction, Multi-bus Organization;

Hardwired Control: Design methods – State table and classical method, A complete Processor,

Micro-programmed Control: Microinstructions, micro- program sequencing, wide branch addressing, microinstructions with next address field, perfecting microinstructions, emulation.

Unit III: Input-Output and Memory Organization **(7 Hours)**

I/O Organization: Accessing I/O devices, Interrupts: Interrupt Hardware, enabling and disabling interrupts, handling multiple requests, Controlling devices, exceptions, Interface circuits, Standard I/O Interfaces: PCI, SCSI, USB;

The Memory System: Memory Hierarchy, Internal organization of memory chips, Cache memory, Performance Considerations, Virtual Memories

Unit IV: Introduction to 16 bit microprocessor (7 Hours)

The 8086 microprocessor, architecture of 8086, pin diagram, programming model of 8086, logical to physical addressing, addressing modes, Instruction set, interrupt structure, 8086 Assembly language programming.

Unit V: Introduction to 32 bit microprocessor (7 Hours)

The 80386 microprocessor, Features and Architecture, Pin Description, Functional Description, Register Set, programming model of 80386: real mode, protected mode and virtual mode, paging and segmentation, Multitasking, Interrupts, Exceptions and I/O

Unit VI: Parallel Architectures and ARM (7 Hours)

Parallel architectures, classification, Instruction level pipelining and Superscalar Processors, The structure of general purpose multiprocessor, Multiple Processor Organizations, Closely and loosely coupled multiprocessors systems,

Advanced RISC Machines (ARM): Introduction to RISC, Instruction execution, characteristics, RISC architecture and pipelining, RISC Vs CISC.

Text Books:

1. C. Hamacher, V. Zvonko, S. Zaky, "Computer Organization", McGraw Hill, 2002, 5th edition.
2. Douglas Hall, "Microprocessors & Interfacing", McGraw Hill, Revised 2nd Edition, 2006.
3. Turley, "Advanced Programming of 80386".

Reference Books:

1. J. Hays, "Computer Architecture and Organization", 2nd Edition, McGraw-Hill, 1988 ISBN 0 – 07 – 100479 – 3
2. Stallings William, "Computer Organization and Architecture: Principles of structure and function", 2nd Ed, Maxwell Macmillan Editions, 1990 ISBN 0 – 02 –946297 – 5
3. John Uffenbeck, "The 8086/88 Family: Design, Programming & Interfacing", PHI,
4. Liu, Gibson, "Microcomputer Systems: The 8086/88 Family", 2nd Edition, PHI,2005

INDUSTRIAL MANAGEMENT (304190)

Teaching Scheme **Examination Scheme**

Lectures/Week: 4 Hrs **Paper: 100 Marks**

Practical/Week: 2 Hrs **Practical: 50 Marks**

Unit I: Current Industrial Management Practices (6 Hours)

The basics of management theory and practices; Quality concepts, phases in quality management; Economic framework, productivity, efficiency and cost-minimization for peer group competitiveness; Globalization perspective; Examples of global business failures.

Unit II : Rise of Convergence Technology and its implication for technology industry and for incumbent industry models with risk of competitive failure from rise of upstart businesses (6 Hours)

Convergence of computing telecommunications, consumer electronics, and content, Surveys; Elements of Convergence Technology (CT); Impact of CT on electronics, software and telecommunications industry; Impact of CT on incumbent industry models with risk of competitive failures, Examples.

Unit III: Impact of CT by way of formulation of innovative, internetworked open system view of business as potential source of information, i. e., as business *IS* view, and need to go beyond TQM and Reengineering: **(6 Hours)**

Mobility as value networking (creating) across the enterprise and inter-enterprise wide supply chains; Development of CT driven innovative, internetworked business models;

Example(s) of business failures in case of non-application of CT driven business models; Examples of information economy based business models; Issues in implementation, Inadequacy of TQM and reengineering techniques; Need for future development in QIS and its organizational and social implications-Complexity Advantage.

Unit IV: **Conceptual Foundations – Designing business *IS* view for complex and changing markets (6 Hours)**

Shift from material and energy processing based exogenous business decision- making to information-origination based endogenous (dynamic) decision-making for business opportunities; Shift from task based business model to process-based business model, Shift from decision-making based on minimal (computing) information to dynamic decision-making based on maximal, shared information; Shift from Collective to Individual Design Decision leading to *IS* view of an engineering system/ an organization/ a firm/ a company/ a business; Description of maximal information for competitive advantage; Systems view of business process *IS* view and its integrity requirements; Implications of uncertainty in *IS* view - System failure from Complex Errors, Need for Information Evaluation - Introduction to Information Integrity (I*I) index, Information Integrity Risk (I*I Risk); Definitional statement of Information Integrity Technology as a new market opportunity space.

Unit V: Introduction to System Dynamics Modeling and Computer Simulation Language Tool for I*I Technology Development (6 Hours)

System Dynamics Approach for Large, Complex Real World Problems, Problem Identification and its System Conceptualization, Introduction to the Computer Simulation Language, Model Formulation, Model Testing and Further Development, Policy Analysis and Recommendation;

Study of System Dynamics Modeling software – STELLA (its educational version).

Unit VI: Information Integrity Technology Development System (6 Hours)

Information as a composite good of interrelated attributes namely, Usefulness (Relevance), how usable is information, and integrity (index of correctness and exactness of information); Attributes of Information integrity; I*I measurement – a definitional treatment; Graphical representation of cost-benefit analysis of I*I for obtaining optimum I*I for minimizing I*I risk in business information decision and achieve competitive advantage; Defining of information topology; Descriptive development of application of information envelope on information topology to generate flexible business information decision; Presentation of systems view of I*I Technology Development System, and its descriptive application to an illustrative problem using System Dynamics methodology.

Text Books:

1. Dinesh Seth and Subhash C. Rastogi, “Global Management Solutions”, Cengage Learning, Second Edition, USA.
2. B. Davis and Margrethe H. Olson, "Management Information Systems", Mc-Graw-Hill International Editions.
3. George P. Richardson and Alexander L. Pugh III, "Introduction to System Dynamics Modeling", System Dynamics Series, PEGASUS Communic1tions.
4. O. P. Khanna, “Industrial Engineering and Management”, Dhanpatrai publications Ltd, New Delhi.

Web Reference:

www.ciir.org.in

Reference Books:

1. V. Rajaraman, and V. V. Mandkc, Editors, "Information Integrity: Issues and Approaches".
2. Don Tapscott, “Digital Economy”, McGraw-Hill, Inc., USA.
3. Michael Hammer, “Beyond Reengineering”, Profile Books, London.

WAVE THEORY AND ANTENNA (304191)

Teaching Scheme
Lectures / Week: 3Hrs
Practical /Week: 2Hrs.

Examination Scheme
Paper: 100 Marks
Practical: 50 Marks

Unit I: Electro Magnetic Waves: (6 Hours)

Maxwell Equations in phasor form, Wave Equation, Uniform Plane wave in Homogeneous, free space, dielectric, conducting medium. Polarization: Linear, circular & Elliptical polarization, unpolarized wave. Reflection of plane waves, Normal incidence, oblique incidence, Electromagnetic Power and Poynting vector.

Unit II: Wave propagation: (5 Hours)

Fundamental equations for free space propagation. Ground, sky & space wave propagations. Structure of atmosphere. Characteristics of ionized regions. Effects of earth's magnetic field. Virtual height, MUF, Skip distance. Ionospheric abnormalities. Multi-hop propagation. Space link geometry.

Unit III: Antenna fundamentals: (5 Hours)

Introduction, Types of Antenna, Radiation Mechanism.

Antenna Terminology: Radiation pattern, radiation power density, radiation intensity, directivity, gain, antenna efficiency, half power beam width, bandwidth, antenna polarization, input impedance, antenna radiation efficiency, effective length, effective area, reciprocity. Radiation Integrals: Vector potentials **A, J, F, M**, Electric and magnetic fields electric and magnetic current sources, solution of inhomogeneous vector potential wave equation, far field radiation.

Unit IV: Wire Antennas and Antenna Arrays: (8 Hours)

Analysis of Linear and Loop antennas: Infinitesimal dipole, small dipole, and finite length dipole half wave length dipole, small circular loop antenna.

Antenna Arrays: Two element array, pattern multiplication N-element linear array, uniform amplitude and spacing, broad side and end-fire array, N-element array: Uniform spacing, non uniform amplitude, array factor, binomial and dolph chebyshev array.

Unit V: LF to HF Antennas: (6 Hours)

Structural details, dimensions, radiation pattern, specifications, features and applications of following antennas: Hertz & Marconi antennas. Effects of ground & antenna height. Electrically short antennas. Beverage antenna. Medium frequency antennas: Tower radiation, construction, feed, ground system. HF antennas: Resonant & non-resonant antennas. Harmonic antenna. V- Antenna. Rhombic antenna. TW antennas. Loop antenna. Ferrite rod antenna. Whip antenna.

Unit VI: VHF to SHF Antennas: (6 Hours)

Structural details, dimensions, radiation pattern, specifications, features and applications of following antennas: Folded dipole, Yagi-Uda, Biconical, Helical, Horn, Slot, Microstrip, Turnstile, Super turnstile & Lens antennas. Antennas with parabolic reflectors.

Text Books:

1. C.A. Balanis, “Antenna Theory - Analysis and Design", John Wiley.
2. E.C. Jordon and E.G. Balman, Electro-magnetic Waves and Radiation Systems, Prentice Hall India.

Reference Books:

1. K. D. Prasad, “Antenna & Wave Propagation”, Satya Prakashan, New Delhi.
2. J. D. Kraus, “Antennas”, Mc Graw Hill.

List of Practicals:

Group A

To Measure Radiation pattern, Return Loss, Impedance, Gain, Beam width for the following antennas (Any Five)

1. Dipole antenna
2. Folded Dipole
3. Yagi-Uda
4. Horn
5. Parabolic Reflector
6. Micro strip Antennas

Group B

Plot Standing Wave pattern and Measure SWR for open, short and matched termination

Group C

MATLAB Simulation of following antenna arrays (Plotting radiation pattern)

1. Broad side linear array with uniform spacing and amplitude
2. End fire linear array with uniform spacing and amplitude
3. Binomial array
4. Dolph-Tchebyshev

Any three of above experiments to be carried out by using any student trial version EM simulation software such as CAD-FEKO, NEC, IE3D etc.

MINI PROJECT AND SEMINAR (304192)

Teaching Scheme **Examination Scheme**
Practical: 2 Hrs/Week **Oral: 50 Marks**

---

1. **Maximum Group Size:** Minimum 2 and maximum 3 students can form a group for the mini project.

2. **Project Type:** The selected mini project must be based on development of a prototype electronic system/product mandatorily having a hardware component with supporting software.

3. **Guidelines for Mini Project** :
   - Projects enhancing the programming skills of the students and making use of softwares like Matlab, pspice, labview, cadfeko and programming languages like c, c ++ and VHDL must be promoted.
   - At an institute level, projects must preferably justify all the domains like Signal processing, Telecommunication engineering etc.
   - Theme based projects can be practiced at an institute level.
   - Software projects must be tested and analysed with all the possible inputs and must take software engineering principals into consideration.

4. **Execution steps for Mini Projects:**
   (i) Complete Paper work Design using datasheets specifying :
      - Selection criteria of the components to be used.
      - Specifications of system i/p and desired o/p.
      - Module based hardware design.
      - Test points at various stages in various modules

   (ii) The circuit should be simulated using any of the standard simulation software available (either complete circuit to be simulated , if possible or an appropriate part of the circuit can be simulated)

   (iii) Algorithm and the flow chart of the software part must be defined.

   (iv) Result verification for hardware and testing the algorithms.

   (v) Comparison with the paper design to identify the discrepancies, if any. Justification of the same must be given.

   (vi) Verified circuit should be assembled and tested on breadboard or general purpose board.

   (vii) Simulation results and/or the snapshots indicating the current and voltage readings or detailing the test point results at various stages must be preserved and included in the project report.

   (viii) Art work / layout of the circuit using standard layout tools.

   (ix) Assembling and testing of circuit on final PCB.

   (x) Design and fabrication of suitable enclosure and outside fittings such as switches, Buttons, knobs, meters, indicators, displays etc.

   (xi) Final testing of the circuit using the earlier defined test points.

   (xii) Preparing Bill of components and materials.

   (xiii) Drawing entire circuit diagram (component level), outlining various blocks indicating test points, inputs and outputs at various stages on A3 graph sheet

5. Guidelines for the Seminar :

- Seminar is based on the Mini Project topic.
- The seminar shall consist of the Literature Survey, Market survey, Basic project work and Applications of Mini project.
- Seminar Assessment shall be based on Innovative Idea, Presentation skill, depth of understanding, Applications, Future Scope and Individual Contribution.
- Maximum three students can deliver a seminar on one topic.(Three students per group)
- Each group shall be given time of 20 mins for presentation and 5 mins for question answer session.
- A certified copy of seminar/ project report shall be required to be presented to external examiner at the time of final examination.

TEST & MEASUREMENT TECHNIQUES (304193)

Teaching Scheme **Examination scheme**

Theory/Week: 01 Hr

Practical /Week: 2Hrs. **Oral: 50 Marks**

List of Experiments:

1) Statistical Analysis
   a) Calculate mean , standard deviation, average deviation, Variance
   b) Probable error for one reading & for mean
   c) Plot histogram
   d) Compare results with 3 ½ & 6 ½ digit DMM

2) Study of DSO
   a) Different modes DSO such as Roll , Average ,Peak Detection
   b) Capture transients
   c) FFT analysis
   d) Various MATH operations
3) Study of True RMS meter
   Measure RMS , Peak , Average of various waveforms

   For example output of Half controlled rectifier & Full controlled rectifire Circuit

4) Virtual Instrument Modelling using software like LABVIEW.
5) Study of programmable LCR meter
   a) Measure L , C & R
   b) Measure Q , Dissipation factor & Power factor of given component.
6) Study of Spectrum Analyzer

   c) Harmonic analysis
   d) Test frequency response of filters & HF amplifier
   e) Spectrum of AM & FM
7) Study of Logic Analyzer
   Timing & state analysis of given DUT

8) Study of OTDR
   a) Measure cable length
   b) Locate faults in the fiber cable
   c) Calculate/ observe various losses such as attenuation loss , bending loss etc
9) Study of Frequency Counter
   Principle of frequency counter, study of its different modes of measurement & different techniques for High frequency measurement

   Measurement of various parameters such as frequency, time, ratio & pulse width.

10) Calibration of DVM

a) Calibrate DVM for DC Voltage measurement.

b) Calibration for AC Voltage measurement.

c) Calibration for DC Current measurement.

11) Study of Network Analyser

a) Gain/Phase measurement

b) Impedance/Reflection measurement