COURSE STRUCTURE

OF

B.TECH (ELECTRONICS & TELECOMMUNICATION ENGINEERING)

2010 ONWARDS

FIRST YEAR

FIRST SEMESTER				SECOND SEMESTER			
THEORY		Contact Hrs.	CR	THEORY		Contact Hrs	CR
Course Code	Subject	L .T .P		Course Code	Subject	L .T .P	
	Mathematics-I	3-1-0	4		Mathematics-II	3-1-0	4
	Physics/Chemistry	3-1-0	4		Chemistry/ Physics	3-1-0	4
	Engg. Mechanics/ Programming and Data structure	3-1-0	4		Programming and Data structure/ Engg. Mechanics	3-1-0	4
	Environmental Science/English for Communication	3-1-0	4		English for Communication/ Environmental Science	3-1-0	4
BEC 101	Basic Electronics/ Basic Electrical Engg.	3-1-0	4	BEC 101	Basic Electrical Engg./ Basic Electronics	3-1-0	4
SESSIONAL		Contact Hrs.	CR	SESSIONAL		Contact Hrs.	CR
Course Code	Subject	L .T .P		Course Code	Subject	L .T .P	
	Physics Lab/ Chemistry Lab	0-0-3	2		Chemistry Lab/ Physics Lab	0-0-3	2
	Language Lab/ Programming Lab	0-0-3	2		Programming Lab/ Language Lab	0-0-3	2
	Engg. Drawing/ Workshop Practice	0-0-3	2		Workshop Practice/ Engg. Drawing	0-0-3	2
BEC	Basic Electronics Lab/ Basic Electrical Engg Lab	0-0-3	2	BEC	Basic Electrical Engg Lab/ Basic Electronics Lab	0-0-3	2
	Total		28		Total		28

SECOND YEAR

THIRD SEMESTER				FOURTH SEMESTER			
Theory		Contact Hrs.	CR	Theory		Contact Hrs	CR
Course Code	Subject	L .T .P		Course Code	Subject	L .T .P	
	Mathematics-III	3-1-0	4		Mathematics-IV	3-1-0	4
	Organizational Behavior / Engg. Economics & Costing	3-1-0	4		Engg. Economics & Costing / Organizational Behavior	3-1-0	4
BEC	Analog Electronics Circuits	3-1-0	4	BEC	Advanced Electronics Circuits	3-1-0	4
BEC	Network Analysis & Synthesis	3-1-0	4	BEC	Analog Comm. Technique	3-1-0	4
BCS	Object Oriented Programming	3-1-0	4	BEC	Digital Electronic Circuits	3-1-0	4
Sessionals				Sessionals			
BEC	Signal Analysis & Synthesis Lab	0-0-3	2	BEC	Digital Electronics Lab.	0-0-3	2
BEC	Analog Electronics Circuits Lab	0-0-3	2	BEC	Analog Comm. Lab.	0-0-3	2
BCS	Object Oriented Programming Lab.	0-0-3	2	BEC	Electronics Circuits Design &Testing Lab.	0-0-3	2
BEC	Circuit Simulation Lab.	0-0-3	2	BEC	Hardware Description Language Lab.	0-0-3	2
	Total		28		Total		28

THIRD YEAR

FIFTH SEMESTER				SIXTH SEMESTER			
Theory		Contact Hrs.	CR	Theory		Contact Hrs	CR
Course Code	Subject	L .T .P		Course Code	Subject	L .T .P	
BEC	Digital Communication Techniques	3-1-0	4	BEC	Electronic Measurement & Measuring Instruments	3-1-0	4
BEC	Microprocessors	3-1-0	4	BEC	Microcontroller & Embedded Systems	3-1-0	4
BEC	Digital Signal Processing	3-1-0	4	BEC	Microwave Engineering	3-1-0	4
BEC	Electromagnetic Field Theory	3-1-0	4	BEE	Control System Engineering	3-1-0	4
BEC	VLSI Engg.	3-1-0	4	BEC	Industrial Electronics	3-1-0	4
Sessionals				Sessionals			
BEC	Digital Communication Lab.	0-0-3	2	BEC	Microwave Engg. Lab.	0-0-3	2
BEC	Microprocessor Lab.	0-0-3	2	BEC	Design &Simulation Lab.	0-0-3	2
BEC	DSP Lab.	0-0-3	2	BEC	Microcontroller & Embedded Systems Lab.	0-0-3	2
BEC	VLSI Lab.	0-0-3	2	BEC	Instrumentation Lab.	0-0-3	2
	Total		28		Total		28

FOURTH YEAR

SEVENTH SEMESTER				EIGHTH SEMESTER			
Theory		Contact Hrs.	CR	Theory		Contact Hrs	CR
Course Code	Subject	L .T .P		Course Code	Subject	L .T .P	
BEC	Communication System Engineering-I	3-1-0	4	BEC	Communication System Engineering-II	3-1-0	4
BEC	Adaptive Signal Processing	3-1-0	4	BEC	Mobile Communication	3-1-0	4
BEC	Digital Image & Speech Processing	3-1-0	4				
Elective-I(Any One)				Elective-III (Any One)			
BEC	Biomedical Instrumentation & Measurement	3-1-0	4	BEC	High Level VLSI Design	3-1-0	4
BEE	Optimal & Adaptive Control System	3-1-0	4	BEC	Telecom Switching & Computer Network	3-1-0	4
BEC	Information Theory & Coding	3-1-0	4	BEC	Bioinformatics	3-1-0	4
BEC	Nanotechnology	3-1-0	4	BEC	Antenna Engg.	3-1-0	4
Elective-II(Any One)				Elective-IV(Any One)			
BEC	Production & Operation Management	3-1-0	4	BEC	Intelligent Instrumentation	3-1-0	4
BCS	Soft Computing	3-1-0	4	BEC	Adv. Comm. System Engineering	3-1-0	4
BCS	Operating Systems	3-1-0	4	BCS	Mobile Computing	3-1-0	4
BEC	DSP Architecture	3-1-0	4	BEC	Cryptography & Network Security	3-1-0	4
BEC	Opto-electronics Devices	3-1-0	4	BEC	Low Power VLSI Design	3-1-0	4
					Intellectual Property Rights	3-1-0	4
Sessionals				Sessionals			
BEC	Minor Project	0-0-3	2	BEC	Comprehensive Viva Voce	0-0-3	2
BEC	Digital Image Processing Lab.	0-0-3	2	BEC	Major Project	0-0-6	6
	Comm. Sys Lab	0-0-3	2				
	Seminar	0-0-3	2				
	Total		28		Total		24

First Semester

BASIC ELECTRONICS

Module-1 (10 Hours)

Introduction to Electronics: Signals, frequency Spectrum of Signals, Analog and Digital Signals, Amplifiers, ICs.
Linear Wave Shaping Circuits: RC LPF, Integrator, HPF, Differentiator.
Properties of Semiconductors: Intrinsic, Extrinsic Semiconductors, Fermi Level, Current Flow in Semiconductors, Hall effects, Diffusion, Lifetime of minority Carriers.
Diodes: p-n junction theory, Current-Voltage characteristics, Analysis of Diode circuits, Rectifiers, Clippers, Clampers, Special diodes.

Module-II (14 Hours)

Bipolar junction Transistor (BJTs): Physical Structures & Modes of Operation, Transistor Characteristics, DC analysis, Transistor switch, Introduction to Small Signal Analysis, The RC coupled amplifiers, Introduction to Power Amplifiers.
Field Effect Transistors (FETs): Physical Structures & Modes of Operation of MOSFETs, MOSFET Characteristics, DC Analysis.
Feedback Amplifiers & Oscillators: General Principles, Topologies, Properties of Negative Feedback, Barkhausen criteria for Oscillation.
Operational Amplifiers (OP-Amps): Ideal OP-AMP, Inverting Amplifier, Adder, Integrator, Differentiator, Non-Inverting Configuration.

Module-III (10 Hours)

Digital Fundamentals: Binary Numbers, Decimal-to-Binary & Binary-to-Decimal Conversion, Binary Addition, Subtraction, Multiplication and Division, Hexadecimal Number Systems, Logic Gates, Boolean Algebra, De Morgan's Theorems, Laws of Boolean Algebra, Flip flops, Shift Registers.

Module-IV (10 Hours)

Cathode Ray Oscilloscope(CRO): Introduction, Cathode Ray Tube, Deflection Sensitivity, Waveform Display, A Basic Oscilloscope, CRO types, Application of CROs. Digital Multimeters.
Principles of Communication: Fundamentals of AM & FM, Radio & TV Transmitters & Receivers, Basic Principles of Optical Fiber Communication.

Text Books:

1. Microelectronics Circuits, A.S Sedra, K.C. Smith, Oxford University Press. Selected portions from chapters 1to 5, 8, 13.
2. Electronics Fundamentals and Applications, D Chattopadhyay and P.C. Rakshit, New Age International Publications. Selected portions from chapters 4 to 14, 16 to 20.

Reference Books:

1. Integrated Electronics, Millman and Halkias, Mc.Graw Hill Publications.
2. Electronic Devices & Circuit Theory, R.L Boylestad and L. Nashelsky, Pearson Education.

(2nd SEM) BEC BASIC ELECTRONICS LABORATORY : (0-0-3) Credit: 2

1. Familiarity with Electronics components & devices.
2. Testing of Semiconductor Diode, Transistor & IC Pins connection (digital Meter should be used).
3. Study & use of CRO to view waveforms and measure its amplitude & frequency.
4. V-I characteristics of a semiconductor diode, Determining DC & AC resistance.
5. Half Wave & Full Wave Rectifier without and with Capacitor filter. Record of Waveforms, Measurement of Average and R.M.S. value.
6. V-I Characteristics of a N-P-N or P-N-P Transistor DC Biasing and Measurement of DC Voltage and currents.
7. Gain frequency response of JFET common source R.C. Coupled Amplified / BJT CE RC coupled amplifier.
8. Op-amp - Inverting, Non –inverting, Integrating & Differentiating Configuration, Record of waveforms.
9. Truth table of Logic gates.

3rd Semester

ANALOG ELECTRONICS CIRCUITS: (3-1-0) Credit: 4

Module-I (10 Hours)

DC biasing of BJTs: Load lines, Operating Point, Fixed bias and Voltage-divider bias. DC bias with voltage feedback, Bias stabilization, Design of bias.

Small Signals Modeling of BJT and their analysis: The r transistor model, Hybrid model, Graphical determination of h-parameters, Low frequency small signal analysis of CE, CC and CB configurations without feedback.

Module-II (8 Hours)

DC Biasing of FETs: Fixed bias, Self bias and Voltage divider bias Configuration, Design of bias. Small Signal Modeling and Analysis of FETs: Small Signal Model, Analysis of JFET C-S and C-D configuration.

System Approach-Effects of R_S and R_L: Two port system, Individual and combined effects of R_S and R_L on CE, Emitter follower and C-S networks.

Module-III (10 Hours)

BJT and JFET Frequency Response: General frequency considerations, Low frequency analysis of R-C combination in single stage BJT or FET amplifier- Bode Plot, Lower Cut off frequency for the system, Low frequency response of BJT and FET amplifiers, Miller Effect Capacitance, High frequency modeling of BJT and FET, High frequency analysis of BJT and FET amplifiers-Bode plot, Square Wave testing of amplifiers.

Compound Configurations: Cascade, Cascode and Darlington connections, C-MOS Circuits, Current Source Circuits

Module-IV (12 Hours)

Feedback and Oscillator Circuit: Feedback concept, Type of feedback circuits, Practical feedback circuit, Analysis of voltage series feedback type amplifier, Effects of negative feedback, Positive feedback, Barkhausen Criterion of oscillation, Oscillator operation, R-C phase shift oscillator, Wien bridge Oscillator, Crystal Oscillator, Hartley & Collpit circuits.

Operational Amplifiers: Equivalent Circuit of OP-AMP circuits, Input impedance, OP-AMP Specifications, DC offset parameters, frequency parameters, Gain-bandwidth, Differential and Common mode operation, op. amp. Applications: Constant gain multiplier, Voltage summing, Integrator, Differentiator and Controlled sources.

Power Amplifiers: Definition of A, B and C types, Conversion efficiency, Distortion analysis, Push-pull configuration.

Text Books:

1. Electronic Devices and Circuit Theory – Robert L.Boylestad and Lowis Nashelsky, 8th Edition Pearson Publication
2. Integrated Electronics – Millman and Halkias, Mcgraw Hill
3. Microelectronic Circuits – Sedra & Smith, International Student Edition
4. Electronic Devices – Floyd, Pearson Education

NETWORK ANALYSIS AND SYNTHESIS (3-1-0)

PART-A (42 Marks)

Module-I (10 Hours)

Transients: DC and AC analysis of RL, RC and RLC series circuits. Resonance: Series and Parallel resonance. Loop and node variable analysis, Waveform Synthesis-The Shifted Unit Step, Ramp and Impulse Function, Waveform Synthesis, The Initial and Final Value Theorems, The Convolution Integral.

Module-II (8 Hours)

IMPEDANCE FUNCTIONS AND NETWORK THEOREMS: The Concept of Complex Frequency, Transform Impedance and Transform Circuit, Series and parallel Combination of Elements, Superposition and Reciprocity, Thevenin's Theorem and Norton's Theorem.

Module-III (8 Hours)

NETWORK FUNCTIONS: POLES AND ZEROS: Terminal Pairs and Ports, Network Function for the One Port and Two Port, The Calculation of Network Function - (a) Ladder Network (b) General Networks. Poles and Zero of Network Functions, Restrictions on Pole and Zero Locations for Driving-Point Functions, Restrictions on Pole and Zero Locations for Transfer Functions, Time-domain Behavior from the Pole and Zero Plot, Stability of Networks.

Module-IV (6 Hours)

TWO-PORT PARAMENTERS: Relationship of Two-Port Variables, Short-Circuit Admittance parameters, The Open-circuit Impedance Parameters, Transmission parameters, The Hybrid parameters, Relationships Between parameter Sets, Parallel Connection of Two-Port Networks.

PART-B (28 Marks)

Module-V (6 Hours)

POSITIVE REAL FUNCTION: Driving-Point Functions, Brune's Positive Real Functions, Properties of Positive Real Functions. TESTING DRIVING-POINT FUNCTIONS: An application of the Maximum Modulus Theorem, Properties of Hurwitz Polynomials, The Computation of Residues, Even and Odd functions, Sturm's Theorem, An alternative Test for Positive real functions.

Module-VI (4 Hours)

DRIVING-POINT SYNTHESIS WITH LC ELEMENTS: Elementary Synthesis Operations, LC Network Synthesis, RC and RL networks. Properties of RC Network Function, Foster Form of RC Networks, Foster From of RL Networks, The Cauer Form of RC and RL Networks.RLC ONE TERMINAL - PAIRS: Minimum Positive Real Functions, Brune's Method of RLC Synthesis.

Module-VII (3 Hours)

TWO TERMINAL-PAIR SYNTHESIS BY LADER DEVELOPMENT: Some properties of $-y_{12}$ and z_{12}. The LC Ladder Development, Other Considerations, The RC Ladder Development.

Text Books:

1. Chapters 8, 9, 10 and 11 from Network Analysis, by M.E. Van Valkenburg, 3rd Edition, PHI.
2. Chapters 3,4,5,6,7,10 and 11 from Introduction to Modern Network Synthesis, by M.E. Van Valkenburg, 3rd Edition

Reference Books:

1. A Course in Electrical Circuits and Analysis, by M.L. Soni and G.C. Gupta.
2. Network Analysis and Synthesis, by Franalin F. Kuo.

BEC (3RD SEM) SIGNAL ANALYSIS & SYNTHESIS LAB: (0-0-3) Credit: 2

List of experiments (Any 8 of the following)

1. Waveform synthesis (generation of square, triangular and sine waves) using shifted functions.
2. Study of DC transients in RL, RC and RLC circuits.
3. Measurement of transform impedance.
4. Verification of Network Theorems.
5. Network functions and pole zero plots
6. Realization of an oscillator by changing (low pass) network elements.
7. Measurement of two port parameters.
8. Measurement of transmission parameters.
9. Synthesis of RL and RC two port networks.
10. Synthesis of RLC two port networks.

BEC (3RD SEM) ANALOG ELECTRONICS CIRCUITS LAB: (0-0-3) Credit: 2

List of experiments (Any 8 of the following)

1. RC Low pass filter& High pass filter: frequency response
2. Clipper & Clamper circuits
3. Study of biasing technique of BJT
4. Study of biasing technique of FET
5. Study of Class A,B power amplifier
6. Study of Diac characteristics
7. Study of out put characteristics of JFET.
8. Study of RC phase shift Oscillator.
9. OPAMP: Integrator & Differentiator circuit.
10. Study of Schmitt Trigger circuit using OPAMP.
11. Study of CMOS Inverter transfer characteristics.
12. Study of characteristics of LDR

BEC (3RD SEM) CIRCUIT SIMULATION LAB: (0-0-3) Credit: 2

Using SPICE/MULTISIM Simulation of

1. Rectifier and Filter Circuits.
2. Biasing circuits for BJT / JFET.
3. Common Emitter/ Common Source RC Coupled Amplifier circuits.
4. Different application circuits using 555 Timer IC.
5. Oscillator Circuits using BJT/OPAmp.
6. Voltage Regulator circuits using Discrete Components / IC.
7. Multivibrator Circuits.
8. Comparator Circuits using OPAmp.
9. Modulation Circuits.
10. Demodulation Circuits

4th Semester

DIGITAL ELECTRONICS CIRCUITS: (3-1-0) Credit: 4

Module-I (12 Hours)

Binary addition and subtraction using 2's complements and 1's complements, Binary codes-BCD codes, Gray codes, Excess-3 code, ASCII Character Code

Gate level Minimization: Boolean functions, Canonical & standard form; min terms & max term, Digital Logic Gates for Multiple inputs. The Map Method, K Map for two, three, four, five input variables, Product of Sum (POS), Sum of product (SOP) simplification, Don't care conditions. NAND & NOR Implementation, AND-OR invert, OR-AND invert implementation, Ex-OR Function, parity generation & checking

Module-II (8 Hours)

Combinational Logic: Combinational Circuits, Analysis & Design of Binary Half Adder & Full Adder circuit, Half and Full-subtractor circuit, Binary Multiplier, Magnitude comparator, Decoders, Encoders, Multiplexers, Error detection& correction: Parity Generator and Checker Circuit

Module-III (12 Hours)

Synchronous Sequential Logic: Sequential Circuit, Latches, Flip-flop (S-R, J-K,D,T,M/S), Analysis of Clocked Sequential circuits, State Reduction & Assignment, Design procedure.

Register &Counters: Shift Register, Synchronous Counter, Modulo-n Counters, Up-Down Counter, Asynchronous Counter, Ripple Counters, Ring Counters

Module-IV (8 Hours)

Memory & Programmable Logic: Read only Memory (ROM), Random Access Memory (RAM), Memory Decoding, Programmable Logic Array (PLA), Sequential Programmable Devices.

Register Transfer Levels: Register transfer Level notion, Algorithm, State machine, Design Example.

Digital Integrated logic Circuits: RTL, DTL, TTL, ECL, MOS & C-MOS Logic circuits

Text books:

1. Digital Design, 3rd edition by M. Morris Mano, PHI
2. Digital Fundamentals – Floyd & Jain, Pearson education
3. Digital Principles & Applications – Malvino, Leach & Saha, 6th Edition, Tata Mc Graw Hill
4. Switching Theory & Digital Electronics – V. K. Jain, Khanna Publishers

Advanced Electronics Circuit (3-1-0)

Module-I (10 Hours)

Review of Selected Topics in Electronic Circuits, Active Filters: First & Second order low pass/high pass, band pass, band reject, and all pass filters. Universal active filter design, Comparators, Sawtooth wave generator using OP Amps, Waveform Conversion, Instrumentation Amplifier. Wideband amplifiers: Frequency response, Transient response of transistor stage, shunt compensation of a transistor stage in cascade, Rise time of cascaded compensated stages, low frequency compensation. Tuned Amplifiers: Single tuned, Double tuned, Staggered tuned.

Module-II (9 Hours)

Bistable Multivibrator: Stable States of a binary, Fixed Biased and Self-biased Transistor binary, Commutating Capacitors, Symmetrical and Unsymmetrical triggering, Direct connected binary, Schmitt trigger Circuit, Emitter coupled Binary. The Monostable Multivibrator: Collector coupled Monostable Multi, Waveforms, Emitter-coupled Monostable Multi, triggering of Monostable Multi. Astable-Multivibrator: Emitter Coupled, Collector Coupled, Waveforms.

Module-III (9 Hours)

Negative resistance devices and Negative Resistance Switching Circuits: Tunnel diode, UJT operation and characteristics, Application of UJT to generate Sawtooth waveform, Tunnel diode monostable, astable, bistable and comparator circuits.

Module-IV (7 Hours)

Analysis of Voltage time base generator, Current time base generator, IC 555 Timer Circuit and Applications, Voltage Controlled Oscillator, Phase Locked Loop.

Text Books:

1. Pulse, Digital and switching Waveforms – Jacob Millman, Herbert Taub, M. Prakash Rao, 2nd Ed, The McGraw-Hill Companies (Selected portions from Chapters 4, 5, 10, 11, 12, 13, 14 and 15)
2. Electronic Principles- A.Malvino, D.Bates, 7th ed, The McGraw-Hill Companies. (Selected Portions from Chapters 21, 22, 23 for Module 1 and 4 only)
3. OP-Amps and Linear Integrated Circuits-Ramakant A.Gayakwad (PHI Learning Pvt.Ltd.)

Reference Books:

1. Pulse and Digital Circuits by A.Anand Kumar, PHI Learning Pvt. Ltd.

ANALOGUE COMMUNICATION TECHNIQUES: (3-1-0) Credit: 4

Module-I (12 Hours)

Spectral Analysis: Fourier Series: The Sampling Function, The Response of a linear System, Normalized Power in a Fourier expansion, Impulse Response, Power Spectral Density, Effect of Transfer Function on Power Spectral Density, The Fourier Transform, Physical Appreciation of the Fourier Transform, Transform of some useful functions, Scaling, Time-shifting and Frequency shifting properties, Convolution, Parseval's Theorem, Correlation between waveforms, Auto-and cross correlation, Expansion in Orthogonal Functions, Correspondence between signals and Vectors, Distinguishability of Signals.

Module-II (14 Hours)

Amplitude Modulation Systems: A Method of frequency translation, Recovery of base band Signal, Amplitude Modulation, Spectrum of AM Signal, The Balanced Modulator, The Square law Demodulator, DSB-SC, SSB-SC and VSB, Their Methods of Generation and Demodulation, Carrier Acquisition, Phase-locked Loop (PLL), Frequency Division Multiplexing.

Frequency Modulation Systems: Concept of Instantaneous Frequency, Generalized concept of Angle Modulation, Frequency modulation, Frequency Deviation, Spectrum of FM Signal with Sinusoidal Modulation, Bandwidth of FM Signal Narrowband and wideband FM, Bandwidth required for a Gaussian Modulated WBFM Signal, Generation of FM Signal, FM Demodulator, PLL, Preemphasis and Deemphasis Filters.

Module-III (12 Hours)

Mathematical Representation of Noise: Sources and Types of Noise, Frequency Domain Representation of Noise, Power Spectral Density, Spectral Components of Noise, Response of a Narrow band filter to noise, Effect of a Filter on the Power spectral density of noise, Superposition of Noise, Mixing involving noise, Linear Filtering, Noise Bandwidth, Quadrature Components of noise.

Noise in AM Systems: The AM Receiver, Super heterodyne Principle, Calculation of Signal Power and Noise Power in SSB-SC, DSB-SC and DSB, Figure of Merit ,Square law Demodulation, The Envelope Demodulation, Threshold

Module-IV (8 Hours)

Noise in FM System: Mathematical Representation of the operation of the limiter, Discriminator, Calculation of output SNR, comparison of FM and AM, SNR improvement using preemphasis, Multiplexing, Threshold in frequency modulation, The Phase locked Loop.

Text Books:

1. Principles of Communication Systems by Taub & Schilling,2nd Edition.Tata Mc Graw Hill. Selected portion from Chapter1, 3, 4, 8, 9 & 10

2. Communication Systems by Siman Haykin,4th Edition, John Wiley and Sons Inc.

References Books:

1. Modern digital and analog communication system, by B. P. Lathi, 3rd Edition, Oxford University Press.

2. Digital and analog communication systems, by L.W.Couch, 6th Edition, Pearson Education, Pvt. Ltd.

(4TH SEM) BEC 294 DIGITAL ELECTRONICS LAB: (0-0-3) Credit: 2

1) Digital logic gates: Investigate logic behavior of AND, OR, NAND, NOR, EX-OR, EX-NOR, Invert& Buffer gates, use of Universal NAND Gate.
2) Gate level minimization: Two level & multi-level implementation of Boolean function.
3) Combinational circuits: design, construct& test: adder& substractor, code converter, gray code to binary and 7 segment displays.
4) Design, Implement & test a given design example with (i)NAND Gate only,(ii)XOR Gate only
5) Design with multiplexers & de multiplexers.
6) Flip flop: Construct, test& investigate operation of SR, D, J-K flip flop.
7) Shift register: Investigate the operation of all types of shift register with parallel load .Design.
8) Counters: design, construct& test various ripple & synchronous counters-decimal counter, Binary counter with parallel load.
9) Memory unit: Investigate the behavior of RAM unit & its storage capacity-16X4 RAM: Testing, simulating, memory expansion.
10) Clock Pulse generator-: design, implement& test.
11) Parallel adder & accumulator: -: design, implement& test.
12) Binary multiplier: design & construct a circuit that multiplier 4 bit unsigned numbers to produce an 8 bit product.

(4TH SEM) BEC ANALOG COMMUNICATION LAB: (0-0-3) Credit: 2

(Experiments under Sl no.1-5 are compulsory; 6-14 are optional)

1. **Amplitude modulation**

i) Generation of DSB-SC with sinusoidal modulating wave, Recording of Modulated waveform with various values of m. Measurement of power in sidebands.

ii) Generation of DSB-SC. Costa's PLL for carrier recovery.

iii)Generation of SSB. Generation of VSB signals.

2. **Frequency Modulation**

i) Generation of Narrow FM using Balanced modulator.

ii) Direct method of generating wideband FM signal.

iii) Study of Pre emphasis &de-emphasis in FM.

3. **Detector circuits**

i) Envelope Detector

ii) Product Detector

iii) FM Discriminator or Balanced Discrimination.

4. Design &study of Low pass, high pass ,band pass &band reject filters(both active& passive –Butterworth type).

5. i)Sampling &Quantization of Sinusoidal signal. Linearity characteristics & Frequency response.

ii)Signal Reconstruction.

6. Generation of PCM signal.

7. Generation of Gaussian Noise (simulation by MATLAB) study on PSD of Noise.

8. Study on SNR of AM, FM &PCM by MATLAB. Simulation

9. Study of MATLAB commands.

10. Study of Fourier series.

11. Finding of Fourier series of a particular signal.

12. Finding out the Fourier transform of two given signal x1(t) and $x_2(t)$ and plot of magnitude and phase of the same signal.

13. Filtering of periodic signal with help of a LTI filter with a given transfer function.

14. To study and generate Gaussian noise using MATLAB codes.

(4TH SEM) BEC ELECTRONIC CIRCUIT DESIGN &TESTING LAB: (0-0-3) Credit: 2

Design, Construction and Testing of

1. Rectifier and Filter Circuits.
2. Biasing circuits for BJT / JFET.
3. Common Emitter/ Common Source RC Coupled Amplifier circuits.
4. Different application circuits using 555 Timer IC.
5. Oscillator Circuits using BJT / OPAMP.
6. Voltage Regulator circuits using Discrete Components / IC.
7. Multivibrator Circuits.
8. Comparator Circuits using OPAMP.
9. Modulation Circuits.
10. Demodulation Circuits

(4TH SEM) BEC HDL LAB: (0-0-3) Credit: 2

Using VHDL / Verilog HDL Simulation of

1. Different Adder Circuits.
2. Different Subtractor Circuits.
3. Multiplexer Circuits.
4. Encoder Circuits
5. Decoder Circuits.
6. Different Flip-Flops Circuits.
7. Memory Circuits.
8. Different Counter Circuits.
9. Register Circuits.
10. ALU circuit.

5th Semester

DIGITAL COMMUNICATION TECHNIQUES (3-1-0)

Module-I (8 Hours)

Sampling Theorem, Low Pass Signal, Band Pass Signal, Signal Reconstruction, Practical Difficulties, The Treachery of Aliasing, The Anti-aliasing Filter, Application of Sampling Theorem, PAM, PWM and PPM Signal Generation and Detection.

Module-II (12 Hours)

Pulse Code Modulation: Quantization of Signals, Uniform and Non-Uniform Quantization, The Compander, The encoder, Transmission Bandwidth and output SNR, Digital multiplexer, Synchronizing and Signaling, Differential PCM, Delta Modulation, Adaptive Delta Modulation, Output SNR, Comparison with PCM.

Noise in PCM and DM: Calculation of Quantization Noise Power, Output Signal Power, and the Thermal Noise Power, Output SNR of PCM using different modulation techniques. Output SNR of DM.

Module-III (12 Hours)

Principles of Digital Data Transmission:
A Digital Communication System, Line Coding-Various line codes, Polar Signaling, ON-OFF Signaling, Bipolar Signaling, Pulse Shaping: Nyquist Criterion for zero ISI, Scrambling, Regenerative Repeater-Preamplifier, Equalizer, Eye diagram, Timing Extraction, Timing Jitter, A Base-band Signal Receiver, Peak Signal to RMS Noise output voltage ratio, The Optimum Filter, White Noise, The Matched Filter- Probability of Error of the Matched Filter, Coherent Reception.

Module-IV (10 Hours)

Digital Modulation Technique:
Generation, Transmission, Reception, Spectrum and Geometrical Representation in the signal space of BPSK, BFSK, Differentially- Encoded PSK, QPSK, Minimum Shifting Keying (MSK), M-ary PSK, M-ary FSK, Use of Signal Space to calculate probability of Error for BPSK and BFSK.

Text Books:

1. Principles of Communication Systems by Taub & Schiling, 2nd Edition, Tata Mc Graw Hill. Selected portion from Chapter 5, 6, 11, and 12.
2. Communication System by Simon Haykin, 4th Edition, John Wiley & Sons, Inc.
3. Modern Digital and Analogue Communication Systems by B.P.Lathi, 3rd Edition, Oxford University Press. Selected Portion from Ch.2, 3, 6, 7, 13, and 14.

Reference Books:

1. Communication System, Analogue and Digital, R.P.Singh & S.D. Sapre, TMH.
2. Digital and Analogue Communication System, Leon W.Couch-II, 6th Edition, Pearson.

ELECTROMAGNETIC FIELD THEORY (3-1-0)

Module-I (12 Hours)

The Co-ordinate Systems, Rectangular, Cylindrical, and Spherical Co-ordinate System. Co-ordinate transformation. Gradient of a Scalar field, Divergence of a vector field and curl of a vector field. Their Physical interpretation. The Laplacian. Divergence Theorem, Stokes Theorem. Useful vector identifies.

Electrostatics: The experimental law of Coulomb, Electric field intensity. Field due to a line charge, Sheet charge and continuous volume charge distribution. Electric Flux and flux density; Gauss's law. Application of Gauss's law. Energy and Potential. The Potential Gradient. The Electric dipole. The Equipotential surfaces. Energy stored in an electrostatic field. Boundary conditions. Capacitors and Capacitances. Poisson's and Laplace's equations. Solutions of simple boundary value problems. Method of Images.

Module-II (10 Hours)

Steady Electric Currents: Current densities, Resistances of a Conductor; The equation of continuity. Joules law. Boundary conditions for Current densities. The EMF.

Magnetostatics: The Biot-Savart law. Amperes Force law. Torque exerted on a current carrying loop by a magnetic field. Gauss's law for magnetic fields. Magnetic vector potential. Magnetic Field Intensity and Ampere's Circuital law. Boundary conditions. Magnetic Materials. Energy in magnetic field. Magnetic circuits.

Module-III (12 Hours)

Faraday's law of Induction; Self and Mutual Induction. Maxwall's Equations from Ampere's and Gauss's Laws. Maxwall's Equations in Differential and Integral forms; Equation of continuity. Comcept of Displacement Current. Electromagnetic Boundry Conditions, Poynting's Theorem, Time-Harmonic EM Fields. Plane Wave Propagation: Helmholtz wave equation. Plane wavw solution. Plane Wave Propagation in lossless and lossy dielectric medium and conductiong medium. Plane wave in good conductor, Surface resistance, depth of penetration. Polarization of EM wave- Linear, Circular and Elliptical polarization. Normal and Oblique incidence of linearly polarized wave at the plane boundry of a perfect conductor, Dielectric-Dielectric Interface. Reflection and Transmission Co-efficient for parallel and perpendicular polarizrtion, Brewstr angle.

Module-IV (8 Hours)

Radio Wave Propagation: Modes of propagation, Structure of Troposphere, Tropospheric Scattering, Ionosphere, Ionospheric Layers - D, E, F1, F2, regions. Sky wave propagation - propagation of radio waves through Ionosphere, Effect of earth's magnetic field, Virtual height, Skip Distance, MUF, Critical frequency, Space wave propagation.

Text Books:

1) Electromagnetic Fields Theory, Fundamental by B.S.Guru & Huseyn R. Hiziroglu. Publication: Thomson Asia Pte.Ltd.Singapore Vikas Publication Home Pvt.Ltd.New Delhi.
2) Electromagnetic Waves and Radiating Systems E.C.Jordan & K.G.Balmin

Reference Books:

1) Elements of Electromagnetic by Mathew N.O.Sadiku, Publisher Oxford University Press, 2) Fields and Wave Electromagnetic, By David K.Cheng,2nd Edition, Publisher :Pearson Education.

VLSI ENGINEERING (3-1-0)

Module-I (10 Hours)

Issues and Challenges in VLSI Design, VLSI Design Methodology, VLSI Design Flow, VLSI Design Hierarchy, VLSI Design Styles, CAD Technology. VLSI Fabrication Technology: Basic Steps of Fabrication, CMOS p-Well and n-Well Processes, Layout Design, Design Rules, Stick Diagram, Bi-CMOS Fabrication Process.

Module-II (10 Hours)

CMOS Inverter: MOS Device Model with Sub-micron Effects, VTC Parameters (DC Characteristics), CMOS Propagation Delay, Parasitic Capacitance Estimation, Layout of an Inverter, Switching, Short-Circuit and Leakage Components of Energy and Power; Interconnects: Resistance, Capacitance Estimation, delays, Buffer Chains, Low Swing Drivers, Power Dissipation, and Performance Optimization of Digital Circuits by Logical Effort and Transistor Sizing.

Module-III (10 Hours)

Combinational Logic Circuits: Static CMOS Logic Circuits: Complementary CMOS, Ratioed Logic, Pass Transistor Logic, Transmission Gate Logic, DCVS Logic, Dynamic CMOS Logic Circuits; Sequential Logic Circuits: Static Latches and Registers, Dynamic Latches and Registers, Pulse Based Registers; Sense Amplifier Based Registers, Semiconductor Memories: Non-Volatile and Volatile Memory Devices, Flash Memories, SRAM, DRAM.

Module-IV (10 Hours)

Design Capture Tools, Hardware Description Language: VHDL, Testing and Verification: Defects, Fault Models, Design Strategies for Testing, Chip Level and System Level Test Techniques, Packaging Technology.

Text Books:

1. J.M. Rabaey, A. Chandrakasan and B. Nikolic, Digital Integrated Circuits- A Design Perspective, 2/e, Prentice Hall of India, 2003.
2. N. Weste and D. Harris, CMOS VLSI Design: A Circuits and Systems Perspective, 3/e, Pearson Education India, 2007.
3. Kang and Leblebici, CMOS Digital Integrated Circuits Analysis and Design, 3/e, McGraw Hill, 2003.

Reference Books:

1. D. A. Hodges, H. G. Jackson, R. Saleh, Analysis and Design of Digital Integrated Circuits in Deep submicron Technology, 3/e, McGraw Hill, 2004.
2. Douglas A.Pucknell, Kamran Eshiraghian, Basic VLSI Design, 3/e P H I, 199
3. J. P. Uyemura, Introduction to VLSI Circuits and Systems, John Wiley & Sons (Asia), 2002
4. W. Wolf, Modern VLSI Design - System on Chip design, 3/e, Pearson Education, 2004.
5. VHDL Programming by example- Perry, T M H

Digital Signal Processing (3-1-0)

Module-I (10 Hours)

Discrete time signals and systems, The Convolution Sum and its properties, Difference Equation, Implementation of DT System, Correlation, LTI systems as Frequency-Selective Filters, Inverse Systems and Deconvolution.

Module-II (10 Hours)

Analysis of LTI system in z-Domain, One-sided z-Transform, The DFT as a linear transformation, Circular Convolution, Circular Correlation, Linear Filtering Methods Based on the DFT, The Discrete Cosine Transform(Brief Idea only).

Module-III (10 Hours)

Fast Fourier Transform Algorithms: Radix –2 FFT algorithm – Decimation – in Time (DIT) and Decimation – in Frequency (DIF) algorithm, Applications of FFT Algorithms, The Chirp-z Transform Algorithm.

Module-IV (10 Hours)

Structures for FIR and IIR Systems - Direct and Cascaded form, Design of Digital Filters: Causality and its Implications, Design of Linear Phase FIR filters using different windows, Design of IIR Filters - Impulse Invariance Method and Bilinear transformation method.

Text Books:

1. Digital Signal Processing – Principles, Algorithms and Applications - J.G.Proakis and D.G.Manolakis, 4th Edition, PHI Learning Pvt. Ltd. (Selected Portions from Chapters 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 13, 14)
2. Digital Signal Processing - S.Salivahanan, A.Vallavaraj, C. Gnanapriya, 2nd Edition The McGraw-Hill Companies. (Selected Portions from Chapters 1, 2, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14)

Reference Books:

1. Introduction to Digital Signal Processing –J.R.Johnson, PHI learning Pvt. Ltd.
2. Discrete Time Signal Processing- A.V. Oppenheim and Schafer, PHI Learning Pvt.
3. Digital Signal Processing: A computer based Approach - Sanjit K. Mitra, The McGraw-Hill Companies.

Microprocessors(3-1-0)

Module-I (8Hours)

Introduction to Microprocessor: Intel 8085 Microprocessor: Architecture, pins & signals, Register organization, Timing &control unit. Instruction Timing & Execution, Instruction set of 8085, Memory & I/O Addressing, Assembly language programming using 8085 instructions set.

Module-II (10Hours)

Memory Interfacing: Interfacing EPROM &RAM Memories: 2764 and 6264.

Stack &Subroutines: Stack, Subroutines, Restart, Conditional Call and Return Instructions. Advanced Subroutine Concepts.

8085 Interrupts: 8085 Interrupts, Vectored Interrupts, Restart as Software Instructions.

Module-III (10Hours)

Microprocessor based system Developments Aids: Programmable peripheral Interface: 8255, Programmable DMA Controller: 8257, Programmable Interrupt Controller: 8259, Programmable Interval Timer: 8253.

Module-IV (12Hours)

Intel 8086(16 bit): Introduction: pins & signal description, Architecture, Bus timing, minimum mode 8086, and maximum mode 8086. Multiprocessor: parallel processing.

Instruction sets of 8086: Instruction formats, Addressing modes, Instruction set: data transfer instruction, arithmetic and logic instruction, program control instructions. assembly language programming with 8086, iterative procedure, recursive procedure, parameter passing.

Intel 80386 and 80486: Architecture, Register Organization, Protected mode, Paging, Virtual mode.

Salient features of Pentium Processor.

Text books:

a. Microprocessor Architecture, programming and applications with 8085 by R.S. Gaonkar.
b. The 8051 Micro controller and Embedded systems by Mazidi and Mazidi,Pearson/PHI Publications.
c. Advanced Microprocessors and Peripherals by A.K.Ray and K.M.Bhurchandi,TMH Publications.

Reference Books:

1) Fundamentals of Microprocessor & Microcomputer by B.RAM

5TH SEM (BEC) DIGITAL COMMUNICATION LABORATORY (0-0-3) Credit: 2

(Experiments under sl. no. 1-8 are mandatory; 9 and 10 should be attempted)

1. AD and DA converters- Linearity.
2. 2 Level to N-Level converter.
3. Delta Modulation and Adaptive Delta Modulation.
4. Generation of PSK, DPSK and QPSK Signal.
5. Generation of FSK and MSK Signal.
6. Generation of ASK and QAM Signals.
7. QPSK Demodulation.
8. Design of a PN sequence Generator.
9. TDM (MAT LAB Simulation).
10. Performance of any digital mod/demod Scheme in the presence of noise (MAT LAB Simulation).

5TH SEM (BEC) MICROPROCESSOR LAB. (0-0-3) Credit: 2

1) Verify some instructions from instruction sets.
2) Addition, Subtraction, Multiplication, Division of two numbers.
3) Binary to Gray Code Conversion.
4) Hexadecimal to decimal conversion.
5) Generation of time delay.
6) Smallest/Largest number from a given data array.
7) Square of a number by adding successive odd integers.
8) Copy data from one memory area to other.
9) Generate square wave on all the ports of 8255.
10) Generate sine wave, triangular wave, and saw tooth wave using DAC.
11) Study of Stepper Motor and its operation.
12) Study of 8253, 8279, 8259.

5TH SEM (BEC) DIGITAL SIGNAL PROCESSING LAB. (0-0-3) Credit: 2

(All 10 experiments should be done, experiment 1-8 are must)

1. Different types of Signal generation using Mat lab.(both continuous and discrete)
2. Linear Convolution of sequences (Without using the inbuilt function (conv) available in MATLAB.)
3. Circular Convolution of two Sequences Comparison of result with the result obtained from linear convolution.
4. i) Finding Auto correlation of a sequence.
   ii) Finding cross correlation of 2 sequences.

   iii) Finding power spectral density of a sequence.

5. Finding the convolution of periodic sequence using DFT and IDFT
6. Implementation of FFT (Fast Fourier Transform) algorithm
   i) Decimation in Time (DIT)

   ii) Decimation in Frequency (DIF)

7. Design of FIR filter (low pass, high pass, band pass). Using windowing technique (harming window, hamming, window rectangular window, Kaiser Window.
8. Design of IIR filter.(Design of Butter worth Filter Design of Chebyshev filter)
9. Convolution of long duration sequences using overlap add, overlap save meter.
10. Working with a DSP processor. (Fixed point-TMS320C-5X/Floating point) series.
    i) Implement convolution (Linear and circular convolution)
    ii) FIR & IIR implementation. With

Lab. Reference:

Digital Signal Processing a hands – on approach by Schucer C, Mohesh Chgave (TMH).

5TH SEM VLSI LAB. (0-0-3) Credit: 2

1 Study of V-I Characteristics of
   a) nMOS Transistor
   b) pMOS Transistor
   c) CMOS Transistor

2. Study of Transfer Characteristics of
   a) Resistive Load Inverter
   b) Pseudo nMOS Load Inverter
   c) nMOS Load Inverter
   d) Depletion Load Inverter
   e) CMOS Inverter

3. Study of Transient Characteristics of
   f) Resistive Load Inverter
   g) Pseudo nMOS Load Inverter
   h) nMOS Load Inverter
   i) Depletion Load Inverter
   j) CMOS Inverter

3. Study of Transient Characteristics of the following Logic Circuits using Gate Logic / Switch Logic.

   a. Two input NAND/AND gate
   b. Two input NOR/OR gate
   c. Two input XNOR/XOR gate

4. Study of Transient Characteristics of the following Logic Circuits using Dynamic Logic.
   a. Two input NAND/AND gate
   b. Two input NOR/OR gate
   c. Two input XNOR/XOR gate

5. Construction of Stick diagram of
   a. Two input NAND/AND gate
   b. Two input NOR/OR gate
   c. Two input XNOR/XOR gat

6. Design, Simulation and FPGA Implementation of

   a) Multiplier Circuit

   b) Divider Circuit

   c) ALU Circuit

   d) Memory Circuit

6th Semester

ELECTRONICS MEASUREMENT & MEASURING INSTRUMENTS (3-1-0)

Module-I (12 Hours)

Basics of Measurements: Accuracy, Precision, resolution, reliability, repeatability, validity, Errors and their analysis, Standards of measurement.Bridge Measurement: DC bridges- wheat stone bridge, AC bridges – Kelvin, Hay, Maxwell, Schering and Wien bridges, Wagner ground Connection.Electronic Instruments for Measuring Basic Parameters: Amplified DC meter, AC Voltmeter, True- RMS responding Voltmeter, Electronic multi-meter, Digital voltmeter, Vector Voltmeter.

Module-II (12 Hours)

Oscilloscopes: Cathode Ray Tube, Vertical and Horizontal Deflection Systems, Delay lines, Probes and Transducers, Specification of an Oscilloscope. Oscilloscope measurement Techniques, Special Oscilloscopes – Storage Oscilloscope, Sampling Oscilloscope,Signal Generators: Sine wave generator, Frequency – Synthesized Signal Generator, Sweep frequency Generator. Pulse and square wave generators. Function Generators.

Module-III (10 Hours)

Signal Analysis: Wave Analyzer, Spectrum Analyzer.

Frequency Counters: Simple Frequency Counter; Measurement errors; extending frequency range of counters Transducers: Types, Strain Gages, Displacement Transducers.

Module-IV (6 Hours)

Digital Data Acquisition System: Interfacing transducers to Electronics Control and Measuring System. Instrumentation Amplifier, Isolation Amplifier. An Introduction to Computer-Controlled Test Systems.IEEE-488 GPIB Bus

Text Books:

1. Modern Electronics Instrumentation & Measurement Techniques, by Albert D.Helstrick and William D.Cooper, Pearson Education. Selected portion from Ch.1, 5-13.
2. Elements of Electronics Instrumentation and Measurement-3rd Edition by Joshph J.Carr.Pearson Education. Selected portion from Ch.1,2,4,7,8,9,13,14,18,23 and 25.

Reference Books :

3. Electronics Instruments and Instrumentation Technology – Anand, PHI
4. Doebelin, E.O., Measurement systems, McGraw Hill, Fourth edition, Singapore, 1990.

MICROWAVE ENGINEERING (3-1-0)

Module-I (14 Hours)

High Frequency Transmission line and Wave guides: The Lumped-Element Circuit model for a Transmission line. Wave propagation. The lossless line. Field Analysis of Co-ax Transmission Lines. R, L, C, G parameters of Co-axial & Two wire Transmission lines, Terminated lossless transmission line, Lowloss line, The Smith Chart. Solution of Transmission line problems using Smith chart. Single Stub and Double Stub matching.

Waveguides: Rectangular waveguides, Field solution for TE and TM modes, Design of Rectangular waveguides to support Dominant TE_{10} only.

Module-II (12 Hours)

TEM mode in Co-ax line. Cylindrical waveguides- Dominant mode. Design of cylindrical waveguides to support dominant TE_{11} mode.

Microwave Resonator: Rectangular waveguides Cavities, Resonant frequencies and of cavity supporting. Dominant mode only. Excitation of waveguides and resonators (in principle only).

Waveguides Components: Power divider and Directional Couplers: Basic properties. The T-Junction power divider, Waveguide-Directional Couplers.

Fixed and Precision variable Attenuator, Isolator, Circulator (Principle of Operation only).

Module-III (10 Hours)

Microwave Sources: Reflex Klystron: Velocity Modulation, Power output and frequency versus Reflector voltage Electronic Admittance. MultiCavity Magnetron: Principle of operation, Rotating field, Π-mode of operation, Frequency of oscillation. The ordinary type (O-type) traveling wave tube- Construction features, principle of operation as an amplifier, Gunn oscillator (principle).

Module-IV (6 Hours)

Microwave Propagation: Line of sight propagation. Attenuation of microwaves by Atmospheric gases, water vapors & precipitates.

Text Books:

1. Microwave Engineering by D.M.Pozor, 2nd Edition, John Willy & Sons. Selected portions from Chapters 2,3,4,6,7&9.
2. Principles of Microwave Engineering by Reich, Oudong and Others.
3. Microwave Devices and Circuits, 3rd Edition, Sammuel Y, Liao, Perason.

Microcontroller and Embedded System (3-1-0)

Module-I (12 Hours)

THE 8051 MICROCONTROLLER: Microcontroller and Embedded Processors, Overview of the 8051 Family 8051 ASSEMBLY LANGUAGE PROGRAMMING: Inside the 8051, Introduction to 8051 Assembly Programming, Assembling and Running an 8051 Program, The Program Counter and ROM Space in the 8051, Data types and Directives, 8051 Flag Bits and the PSW Register, 8051 Register Banks and Stack

JUMP, LOOP, AND CALL INSTRUCTIONS: Loop and Jump Instructions, Call Instructions, Time Delay Generation and Calculation, I/O PORT PROGRAMMING: Pin Description of the 8051, I/O Programming; Bit manipulation, 8051 ADDRESSING MODES: Immediate and Register Addressing Modes, Accessing Memory Using Various Addressing Modes

Module-II (10 Hours)

ARITHMETIC INSTRUCTIONS AND PROGRAMS: Unsigned Addition and Subtraction, Unsigned Multiplication and Division, Signed Number Concepts and Arithmetic Operations, LOGIC INSTRUCTIONS AND PROGRAMS: Logic and Compare Instructions, Rotate and Swap Instructions, BCD and ASCII Application Programs.

Module-III (10 Hours)

SINGLE- BIT INSTRUCTIONS AND PROGRAMMING: Single-Bit Instruction Programming, Single-Bit Operations with CY, Reading Input Pins vs. Port Latch, TIMER/COUNTER PROGRAMMING IN THE 8051: Programming 8051 timers, Counter Programming, 8051 SERIAL COMMUNICATION: Basics of serial Communication, INTERRUPTS PROGRAMMING: 8051 Interrupts, Programming Timer Interrupts.

Module-IV (8 Hours)

INTERFACING: Interfacing a Stepper Motor, 8051 /31 INTERFACING TO EXTERNAL MEMORY: Semiconductor Memory, Memory Address Decoding, 8031/51 Interfacing with External ROM, Data Memory Space, 8031/51 INTERFACING TO THE 8255: Programming the 8255, 8255 Interfacing, and Other Modes of the 8255

Text Book:

1. M.A. Mazdi & J.G. Mazdi; *The 8051 Microcontroller and Embedded System,* Pearson Education India, 2005.
2. R. Kamal; *EMBEDDED SYSTEMS Architecture, Programming and Design;* Tata McGraw-Hill Publishing Company Limited; 2003.

Industrial Electronics (3-1-0)

Module-I (10 Hours)

DC AMPLIFIERS: Need for DC amplifiers, DC amplifiers—Drift, Causes, Darlington Emitter Follower, Cascode amplifier, Stabilization, Differential amplifiers—Chopper stabilization, Operational Amplifiers, Ideal specifications of Operational Amplifiers, Instrumentation Amplifiers. REGULATED POWER SUPPLIES: Block diagram, Principle of voltage regulation, Series and Shunt type Linear Voltage Regulators, Protection Techniques— Short Circuit, Over voltage and Thermal Protection.

Module-II (10 Hours)

SWITCHED MODE & IC REGULATORS : Switched Mode voltage regulator, Comparison of Linear and Switched Mode Voltage Regulators, Servo Voltage Stabilizer, monolithic voltage regulators Fixed and Adjustable IC Voltage regulators, 3-terminal Voltage regulators—Current boosting . SCR AND THYRISTOR: Principles of operation and characteristics of SCR, Triggering of Thyristors, Commutation Techniques of Thyristors—Classes A, B, C, D, E and F, Ratings of SCR.

Module-III (10 Hours)

APPLICATIONS OF SCR IN POWER CONTROL: Static circuit breaker, Protection of SCR, Inverters—Classification, Single Phase inverters, Converters – single phase Half wave and Full wave. DIAC, TRIAC AND THYRISTOR APPLICATIONS: Chopper circuits – Principle, methods and Configurations, Diac and Triac, Triacs – Triggering modes, Firing Circuits, Commutation.

Module-IV (10 Hours)

INDUSTRIAL APPLICATIONS - I
Industrial timers -Classification, types, Electronic Timers – Classification, RC and Digital timers, Time base Generators. Electric Welding – Classification, types and methods of Resistance and ARC wielding, Electronic DC Motor Control.

INDUSTRIAL APPLICATIONS – II
High Frequency heating – principle, merits, applications, High frequency Source for Induction heating. Dielectric Heating – principle, material properties, Electrodes and their Coupling to RF generator, Thermal losses and Applications.Ultrasonics – Generation and Applications.

Text Books:

1. Industrial and Power Electronics – G.K. Mithal and Maneesha Gupta, Khanna Publishers, 19th Ed., 2003.
2. Integrated Electronics – J. Millman and C.C Halkias, McGraw Hill, 1972.

Reference Books :

1. Electronic Devices and circuits – Theodore.H.Bogart, Pearson Education,6th Edn., 2003.
2. Thyristors and applications – M. Rammurthy, East-West Press, 1977.
3. Integrated Circuits and Semiconductor Devices – Deboo and Burroughs, ISE.

6TH SEM (BEC) MICROWAVE ENGG LAB (0-0-3) Credit: 2

1. Study of Microwave Components
2. Measurement of voltage Standing Wave ratio (VSWR) in a wave guide.
3. Measurement of frequency of the Microwave source
4. Measurement of unknown impedance
5. Study of attenuators Characteristics
6. Study of Directional coupler Characteristics
7. Study of Gunn Oscillator Characteristics
8. Study of Reflex Klystron Characteristics.
9. Study of Magic-T Characteristics

6TH SEM DESIGN & SIMULATION LABORATORY (0-0-3) Credit: 2

(All are compulsory)

(Use of circuit simulator s/w PSPICE or CAD circuit maker TSPICE)

1. Multivibrator design (simulation using transistors).
2. Amplifier designs (2 stages, 3 stages) obtain Frequency Response.
3. Given the message signal, Carrier signal simulate a DSB-AM system.
    i) Obtain the modulated waveform.
    ii) Calculate power.
    iii) Add noise to the modulated signal (Gaussian or White) (SNR), so as to achieve a particular SNR and find out noise power.
4. Simulate the constant Envelope PSK signal, waveform for different values of M. M=2, 4, 8.
5. Phase locked lop design.
6. Design a Huffman code for a sourced with given:
    i) Length and Corresponding Probabilities
    ii) Determine the entropy of source
7. Generation of a sinusoidal signal of given amplitude and frequency. Using uniform PCM scheme

    iii) Quantize it once to 8 levels
    iv) Quantize it once to 16 levels

    Plot the original signal and the quantized signals on the same axes. Compare the resulting SQNRs in the two cases.

8. Simulation to estimate the probability of error for the binary communication system plot P_e- SNR for a binary communication system employing matched fitter.
9. Design and Simulate a Gaussian Noise Generator.
10. Design a PCM system to a given specifications and study its performance by simulation using MATLAB.

6TH SEM MICROCONTROLLER & EMBEDDED SYSTEMS LABORATORY (0-0-3) Credit: 2

1) Verify some instructions of 8051 microcontroller.
2) Initialize data to register and memory using immediate, register, direct and indirect addressing mode.
3) Addition, Subtraction of 16 bit number.
4) Multiplication, Division of 16 bit number.
5) Generation of time delay.
6) Monitor P2.0 bit. When it is high, send 99H to P1.
7) Copy ten bytes of data from ROM space 400H in to RAM space 30H.
8) ASCII to BCD conversion.
9) Program 8255 to get data from PA and send to both PB and PC.
10) Interface DIP Relay to 8051 microcontroller.
11) Interface LEDs on PA1 of 8051 microcontroller.
12) Interface LEDs on PB of 8255.

6TH SEM INSTRUMENTATION LABORATORY (0-0-3) Credit: 2

1. Study of resistance & temp -voltage characteristics of Thermistor.

2. Study of resistance & temp -voltage characteristics of RTD.

3. Measurement of temperature-voltage characteristics of Thermocouple.

4. Determination of characteristics between strain applied & the voltage output.

5. Study of the characteristics of LVDT and plotting the displacement-voltage graph.

6. Plotting the characteristics between strain applied to a beam and the output voltage for a strain gauge.

7. Study of PID controller.

8. Study of Temperature control system.

7th Semester

COMMUNICATION SYSTEM ENGINEERING -I (3-1-0)

Module-I and II 20 Hours

Optical Fiber System

Elements of Optical Fiber Communication System, Basic Optical Laws and Definitions, Optical Fiber Modes and Configurations, Single Mode Fiber, Graded Index Fiber Structure, Attenuation and Distortion in optical Fibers, LED and LASER Diodes, PIN Photo Detector, Avalanche Photo Diode , Optical Fiber System Link Budget.

Module-III and IV 20 Hours

Satellite System

Kepler's Law, Satellite Orbits, Spacing and Frequency Allocation, Look Angle, Orbital Perturbation, Satellite Launching, Earth Station, Satellite Sub-systems, Satellite System Link Models, Link Equations, Multiple Access, Direct Broadcast Satellite Services, Application of LEO, MEO and GEO Satellites.

Text Books:

1. Optical Fiber Communications by Gerd Keiser, 4th Edition, Mc Graw-Hill International Editions.
2. Satellite Communications by Timothy Pratt, Charles Bostian and Jeremy Allnutt, 2nd Edition, Wiley Student Edition.

ADAPTIVE SIGNAL PROCESSING (3-1-0)

Module-I (10 Hours)

Multirate Digital Signal Processing:
Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by rational factor I/D, Filter Design and Implementation for sampling-rate, Multistage implementation of sampling rate conversion, Sampling rate conversion of Band pass signal, Application of multi rate signal processing: design of phase shifters, Implementation of narrowband lowpass filters. Implementation of Digital filter banks. Filter Bank and Sub-band Filters and its applications.

Module-II (10 Hours)

Linear prediction and Optimum Linear Filters:
Innovations Representation of a stationary random process, Forward and Backward Linear Prediction, Solution of the normal equations, Properties of the linear prediction-error filters, AR lattice and ARMA lattice- ladder filters, Wiener filter for filtering and Prediction: FIR Wiener Filter, Orthogonality Principle in linear mean-square estimation.

Module-III (8 Hours)

Power Spectrum Estimation:
Estimation of spectra from finite-duration observation of signals, Non parametric method for power spectrum estimation: Bartlett method, Blackman and Turkey method, parametric method for power estimation: Yuke-Walker method, Burg method, MA model and ARMA model.

Module-IV (12 Hours)

Adaptive Signal Processing:
Basics of Wiener filtering, Widrow-Hopf Equation, Least mean square algorithm, Recursive least square algorithm, variants of LMS algorithm: FX-LMS, Fast LMS, N-LMS, PN-LMS. Design of Adaptive FIR & IIR filters, Application of adaptive signal processing: Adaptive linear combiner, System identification, Channel equalization, adaptive noise cancellation, adaptive line enhancer.

Text Books:

1. Digital Signal Processing, Third Edition, J.G. Proakis and D.G. Manolakis, Prentice Hall.
2. Adaptive Signal Processing, B. Widrow and Stern,

Reference Books:

1. Digital Signal Processing, by Sanjit K Mitra, new edition, TMH.
2. Digital Signal Processing, by Salivahanan, new edition, TMH.

DIGITAL IMAGE & SPEECH PROCESSING(3-1-0)

Module –I Digital Image (12 Hours)

1. Different stages of Image processing & Analysis Scheme. Components of Image Processing System, Multiprocessor Interconnections.
2. A Review of various Mathematical Transforms.
3. Image Formation: Geometric Model, Photometric Model.
4. Image Digitization : A review of Sampling and quantization processes. A digital image.

Module – II Image Processing (12 Hours)

5. Image Enhancement: Contrast Intensification, Smoothing, Image sharpening.
6. Restoration : Minimum Mean – Square Error Restoration by Homomorphic Filtering
7. Image Compression : Schematic diagram of Data Compression Procedure, Lossless compression coding.
8. Multivalued Image Processing
   Multispectral Image Processing, Processing of colour images.

Module –III Digital Speech Processing (8 Hours)

The Fundamentals of Digital Speech Processing. A Review of Discrete-Time Signal & Systems , the Z-transform, the DFT, Fundamental of Digital Filters, FIR system, IIR Systems.

1. Time –Domain Methods for Speech Processing.
   Time-Dependent Processing of speech, short-time energy and Average Magnitude, Short time Average Zero- Crossing Rate.
2. Digital Representation of speech Waveform
   Sampling speech signals,statistical model,Instantaneous quantization, Instantaneous companding, quantization for optimum SNR,Adaptive quantization,Feed-forward Feedback adaptions.

Module –IV Linear Predictive Coding of Speech (8 Hours)

Block diagram of Simplified Model for Speech Production. Basic Principles of Linear Predictive Analysis- The Auto Correlation Method. The Prediction Error Signal .

Digital Speech Processing for Man-Machine Communication by voice. Speaker Recognition Systems- Speaker verification and speaker Identification Systems.

Text Books: (Digital Image Processing)

1. Digital Image Processing and Analysis by B.Chanda & D.Dutt Majumdar, PHI, 2001.selected portions from Chapter 1-10.
2. Fundamentals of Digital Image Processing by Anil K. Jain, Prentice Hall of India-2002.
3. Digital Image Processing –2nd Edition by Rafael C.Gonzalez and Richard E.Woods, Pearson E ducation

References Books:

1. Digital Image Processing using MAT LAB by R.C.Gonzalez, R.E. Woods and steven L.Eddins, Pearson Education.

Text Books: (Digital Speech Processing)

1.Digital Processing of Speech Signals by L.R.Rabinu and R.W Schafer, Pearson Education, Selected portions from Ch. 1,2,4,5,8&9.

References Books:

1. Fundamentals of Speech Recognition, by L.Rabiner and Biing-Hwang Juang Pearson Education.
2. Speech Communications,2nd Edition , by Douglas O' Shaughessy, University Press.

7th Semester (Elective – I)

OPTIMAL AND ADAPTIVE CONTROL SYSTEM ENGINEERING (3-1-0)

Module-I (10 Hours)

Introduction - Optimal control problem, Problem formulation, Performance measures for various types of Optimal control problems- Linear regulator problem-Tracking Problem-Minimum time Problems-Minimum energy problems-definitions of LQG / LQR Problems-Introduction to the applications of Optimal control design-Examples.

Variational approach to Optimal control problems-Necessary conditions for optimal control with different-Boundary conditions in Optimal control problem

Module-II (12 Hours)

Linear regulator problem, Tracking problem, Pontryagin's minimum principle-Sate inequality constraints – Minimum time problems – Minimum control effort problems, Dynamic programming: Principles of optimality programming-Examples, Functional equation of dynamic programming- Recurrence relation of dynamic programming – Curse of dimensionality – Discrete linear regulator problem – Hamilton-Jacobi – Bellman equation.

Module-III (8 Hours)

Introduction to adaptive control, Effects of process variations, Adaptive control schemes, Adaptive control problem, Linear in parameter models, ARX, ARMAX, ARIMAX, Least square estimation, Recursive least square estimation, Extended least square estimation, Maximum likelihood estimation, self- tuning regulator.

Module-IV (12 Hours)

Model reference adaptive controller: The MIT rule , Lyapunov theory, Design of model reference adaptive controller using MIT rule and Lyapunov theory, Relation between model reference adaptive controller and self-tuning regulator, Tuning of controllers and case studies: Design of gain scheduling controller – Auto tuning of PID regulator, Stability analysis of adaptive controllers – Application of adaptive control.

Reference Books:

1. Donald E. Kirk, "Optimal Control Theory: An introduction", Prentice Hall,
2. Brian D.O. Anderson, John B Moore, "Linear Optimal Control", Prentice hall.
3. Karl J. Astrom & Bjorn Witten Mark, "Adaptive Control", Pearson Education
4. Shankar Sastry and Marc Bodson, "Adaptive Control-Stability, Convergence and Robustness", PHI.

7th Semester (Elective – I)

BIO-MEDICAL INSTRUMENTATION AND MEASUREMENT (3-1-0)

Module – I (12 Hours)

Biometrics, Man-Instrument System, Problems encountered in measuring a living system.

Review of Transducers, Transducers for Biomedical applications.

Sources of Bioelectric Potentials - Resting and Action Potentials. Propagation on action Potentials. Bioelectric Potentials– Electrocardiogram. Typical human electro encephalogram., electromyogram.

Electrodes : Electrode Theory, Biopotential Electrodes, Microelectrodes, Body surface electrodes. Bio chemical Transducers – the pH electrodes, Blood Gas Electrodes.

Module –II (10 Hours)

Cardiovascular Measurements:

Electrocardiography, Measurement of Blood Pressure – Programmed electrosphygm Manometer. Measurement of Blood flow and Cardiac output, Measurement of Heart Sounds Frequency Spectrum of heart.

Module-III (10 Hours)

Measurements on Nervous System

Psycho physiological Measurement- Polygraph, EEG, Brain Imaging-X-Ray, Computed Tomography (CT), MRI, Eye Electrorefinogram (ERG), Opthalmoscopy, Audiometry, Electromyography(EMG).

Measurement in Respiratory System: Pulmonary Volume and its measurement-Spiro meter, Pneumotachometer, Kidney Image: Pyelogram, Hemodialysis, Peritonal Dialysis, Skin: Water loss, Flow Hygrometry, Colour Dermaspectrometer.

Module-IV (9 Hours)

Non-invasive Diagnostic Measurements:

Body Temperature Measurement: Electronics Thermo meter, Skin Temperature Measurement-Thermography, Principle of Ultrasonic measurement - Ultrasound, Modes of Transmission, Ultrasonic imaging , Ultrasonic diagnosis.

Computers in Biomedical Instrumentation, Computer Analysis of Electro Cardio-gram, Patient Monitoring, Computerized Axial Tomography(CAT) Scanner and other applications.

Text Books:

1. Biomedical Instrumentation and Measurements, 2nd Edition, by L. Cromwell, F. J. Weibell and E. A. Pfeiffer, Pearson Education.
2. Bioinstrumentation by John. Webster-editor, John Willey students' Edition.

References Books:

1. Introduction to Biomedical Equipment Technology, 4th Edition by Joseph J. Carr and John M. Brown, Pearson Education.
2. Biomedical Digital Signal Processing – By Willis J. Tompkins-Editor, Prentice Hall of India.

7th Semester (Elective – I)

INFORMATION THEORY & CODING (3-1-0)

Module –I (8Hours)

Information Theory and Source Coding
Introduction to Information Theory, Uncertainty and Information, Average Mutual Information and Entropy, Information Measures for Continuous Random Variables, waveform sources
Amplitude Quantizing: quantizing noise, uniform quantizing, non-uniform quantizing
Differential Pulse Code Modulation: one-tap prediction, N-tap prediction, delta modulation, sigma delta modulation, sigma delta A-to-D convertor(ADC), sigma delta D-to-A convertor(DAC)
Block coding: vector quantizing, Transform Coding: quantization for transform coding, Sub-band Coding
Source Coding for Digital Data: properties of codes, Huffman codes, Run-length codes

Module –II (12Hours)

Waveform coding: Antipodal and Orthogonal signals, Orthogonal and Biorthogonal codes, waveform coding system example, Types of error control: Terminal connectivity, automatic repeat request
Structured Sequence: Channel models, Channel capacity, Channel coding, Information Capacity Theorem, The Shannon Limit, Introduction to Error correcting codes, code rate & redundancy, parity check codes: Single parity check code, Rectangular code
Linear Block codes: vector spaces, vector subspaces, A(6,3) linear block code example, Generator matrix, systematic linear block codes, parity-check matrix, syndrome testing, error correction , Decoder implementation
Error Detecting & Correcting Capability: weight & distance of binary vectors, minimum distance of linear code, error detection & correction, visualization of a 6-tuple space, erasure correction
Usefulness of Standard Array: estimating code capability, an (n, k) example, designing the (8,2) code, error detection vs. error correction trade-off
Cyclic Codes: algebraic structures of cyclic code, binary cyclic code properties, encoding in systematic form, circuit for dividing polynomial, systematic encoding with an (n-k)-stage shift register, error detection with an (n-k)-shift register
Well-Known Block Codes: Hamming codes, extended Golay code, BCH codes.

Module –III (12Hours)

Convolutional Encoding, Convolutional Encoder Representation: connection representation, state representation & the state diagram, the tree diagram, the trellis diagram
Formulation of the Convolutional Decoding Problem: maximum likelihood decoding, channel models: hard versus soft decisions, Viterbi Convolutional Decoding Algorithm, an example of viterbi convolutional decoding, decoder implementation, path memory and synchronization
Properties of Convolutional Codes: distance properties of convolutional codes, systematic & non-systematic convolutional codes, catastrophic error propagation in convolutional codes, performance bounds for convolutional codes, coding gain, based known convolutional codes, convolutional code rate trade-off, soft-decision viterbi decoding
Other Convolutional Decoding Algorithms: sequential decoding, comparisons & limitations of viterbi & sequential decoding, feedback decoding.

Module –IV (8Hours)

Reed-Solomon Codes: Reed-Solomon Error Probability, Why R-S codes perform well against burst noise, R-S performance as a function of size, redundancy, and code rate
Interleaving & Concatenated Codes: Block interleaving, Convolutional interleaving, concatenated codes
Coding & Interleaving Applied to CD Digital Audio System: CIRC encodings, CIRC decoding, interpolation & muting
Turbo Codes: turbo code concepts, log-likelihood algebra

Text Books:

1. Digital Communications - Fundamentals and Applications - Bernard Sklar, 2nd Edition of Person Education Publication
2. Information Theory, Coding & Cryptography - Ranjan Bose, TMH Publication
3. Digital Communications – Simon Haykin, Wiley Edition
4. Digital Communications - J.G.Proakis, 3rd Edition, Mc Graw Hill Publications.

7th Semester (Elective – I)

NANOTECHNOLOGY(3-1-0)

Module – I (10 Hours)

1) Introduction: A definition, Some nano challenges, The fundamental science behind nanotechnology – Electrons, Atoms and ions, Molecules,
2) Tools of Nanosciences: Tools for measuring nanostructures – Scanning probe instruments, Spectroscopy, Electrochemistry, Electron microscopy, Tools to make nanostructures: Scanning probe Instruments, Nanoscale lithography, Dip pen nanolithography, E-beam lithography, nanosphere liftoff lithography, Molecular Synthesis, Self-assembly, Nanoscale crystal growth, Polymerization, Nanobricks and building blocks, Tools to imagine nanoscale behaviour.

Module – II (10 Hours)

3) Points and Places of Interests: Smart materials, Sensors, Nanoscale biostructures, Energy Capture – transformation and storage, Optics, Magnets, Fabrications, Electronics, Modeling.
4) Smart Materials: Self – healing structures, Recognition, Separation, Catalyst, Heterogeneous nanostructures and composites, Encapsulation, Consumer goods.

Module – III (10 Hours)

5) Sensors: Natural nanoscale sensors, Electromagnetic sensors, Biosensors, Electronic noses.
6) Biomedical Applications: Drugs, Drug delivery, Photodynamic therapy, Molecular motors, Neuro-electronic interfaces, Protein engineering.

Module-IV (10 Hours)

7) Optics and Electronics: Light energy-its capture and photovoltaics, Light production, Light transmission, Light control ansd manipulation, Electronics, Carbon nanotubes, Soft molecule electronics, Memories, gates and switches.
8) Nano business: Nanotechnology, The next industrial revolution, High tech – nano tech – bio tech, The investment landscape, Nano ethics.

Text Book:

1. Nanotechnology by M Ratner and D. ratner, Pearso Education Publication.

7th Semester (Elective – II)

Soft Computing(3-1-0)

Module-I (06 Hours)

Basic tools of soft Computing – Fuzzy logic, Neural Networks and Evolutionary Computing , Approximations of Multivariate functions, Non – linear Error surface and optimization.

Module-II (10 Hours)

Fuzzy Logic Systems : Basics of fuzzy logic theory, Crisp and fuzzy sets. Basic set operations. Fuzzy relations, Composition of Fuzzy relations, Fuzzy inference, Zadeh's compositional rule of inference. Defuzzificaiton. Fuzzy logic control: Mamdani and Takagi and Sugeno architectures. Applications to pattern recognition.

Module-III (16 Hours)

Neural networks : Single layer networks, Perceptron. Activation functions. Adalinc: its training and capabilities, weights learning, Multilayer perceptrons : error back propagation, generalized delta rule. Radial basis function networks and least square training algorithm, Kohenen self – organizing map and learning vector quantization networks. Recurrent neural networks, Simulated annealing neural networks. Adaptive neuro-fuzzy information ;systems (ANFIS), Applications to control and pattern recognition.

Module-IV (08 Hours)

Evolutionary Computing : Genetic algorithms : Basic concepts, encoding , fitness function, reproduction. Differences of GA and traditional optimization methods. Basic genetic programming concepts Applications.

Text Books.:

1. V. Keeman, "Learning and Soft computing", Pearson Education, India.
2. J.S.R. Jang. C.T. SUN and E. Mizutani, "Neuro-fuzzy and soft-computing". PHI Pvt. Ltd. , New Delhi.
3. Fredric M. Ham and Ivica Kostanic, "Principle of Neuro Computing for Science and Engineering", Tata McGraw Hill.
4. S. Haykins, "Neural networks : a comprehensive foundation". Pearson Education, India.

7th Semester (Elective – II)

Operating System(3-1-0)

Module-I (12 Hours)

Introduction: What Is an Operating System.

Simple Batch System, Multiprogramming and Time Sharing Systems, Personal Computer Systems, Parallel Systems, Distributed Systems and Real Time Systems.

Operating system structures: System components, protection system, O.S. services, system calls.

Process Management: Process concept, Process Scheduling, Operation on processes, Cooperating Processes, Interprocess communication, Threads CPU Scheduling: Basic concepts, scheduling criteria, scheduling algorithms.

Module-II (12 Hours)

Deadlocks: System model, Deadlock characterization methods for handling Deadlocks, Deadlock Prevention, Deadlock avoidance, Deadlock detection, recovery from Deadlock.

Memory Management: Background, Logical versus physical address space, swapping, contiguous Allocation, Paging Segmentation.

Virtual Memory: Background, Demand paging, performance of Demand paging, Page Replacement, Page Replacement Algorithms, Allocation of frames, Trashing.

Module-III (6 Hours)

File-system Interface: File concept, Access Methods, Allocation Methods, Directory implementation, Recovery.

Module-IV (10 Hours)

I/O Systems: Overview, I/O Hardware, Application of I/O interface, Kernel I/O – subsystem Transforming I/O requests to Hardware Operations. Secondary storage Structure: Disk Structure, Disk Scheduling, Disk Management, Swap space Management, Disk Reliability, Case Studies LINMUX, WINDOW NT.

Text Books:

1. Operating System Concepts: Abraham Silberschatz and Peter Bear Galvin, Addison Wesley.

Chapter-1, Chapter-3 (3.1,3.2,3.3), Chapter-4, Chapter-5 (5.1,5.2,5.3), Chapter-7 (7.1,7.7), Chapter-8, Chapter-9, Chapter-10, Chapter-11, Chapter-12 (12.1-12.5), Chapter-13 (13.1-13.5)

Reference Books:

1. Operating System, McGraw Hill, Madnik & Donovan
2. Operating System and System Programming, SCITECH, P.Blkeiahn Prasad
3. Morden O.S. – PHI, Andrew, S. Tannenbaum

7th Semester (Elective – II)

DSP ARCHITECTURE (3-1-0)

Module-I (10 Hours)

Computational characteristics of DSP algorithms and applications; their influence on defining a generic instruction-set architecture for DSPs.

Architectural requirement of DSPs: high throughput, low cost, low power, small code size, embedded applications. Techniques for enhancing computational throughput: parallelism and pipelining.

Module-II (10 Hours)

Data-path of DSPs: multiple on-chip memories and buses, dedicated address generator units, specialized processing units (hardware multiplier, ALU, shifter) and on-chip peripherals for communication and control.

Control-unit of DSPs: pipelined instruction execution, specialized hardware for zero-overhead looping, interrupts.

Module-III (10 Hours)

Architecture of Texas Instruments fixed-point and floating-point DSPs: brief description of TMS320 C5x /C54x/C3x DSPs; Programmer's model.

Architecture of Analog Devices fixed-point and floating-point DSPs: brief description of ADSP 218x / 2106x DSPs; Programmer's model.

Module-IV (10 Hours)

Advanced DSPs: TI's TMS 320C6x, ADI's Tiger-SHARC, Lucent Technologies' DSP 16000 VLIW processors.

Applications: a few case studies of application of DSPs in communication and multimedia.

Texts/Reference:

1. P. Pirsch: Architectures for Digital Signal Processing; John Wiley, 1999.

2. R. J. Higgins: Digital Signal Processing in VLSI; Prentice-Hall, 1990.

3. Texas Instruments TMSC5x, C54x and C6x Users Manuals.

4. Analog Devices ADSP 2100-family and 2106x-family Users Manuals.

5. K. Parhi: VLSI Digital Signal Processing Systems; John Wiley, 1999.

6. K. Parhi and T. Nishitani: Digital Signal Processing for Multimedia Systems; Marcel Dekker, 1999.

7. IEEE Signal Processing Magazine: Oct 88, Jan 89, July 97, Jan 98, March 98 and March 2000.

7th Semester (Elective – II)

OPTO ELECTRONIC DEVICES (3-1-0)

Module-I

Sources: (12 Hours)

Light Emitting Diodes (LEDs), LED Structures, Light Source Materials, Internal Quantum Efficiency, Modulation Capacity, Transient Response, Power – Bandwidth Product, Laser Diodes, Laser Diode Modes and Threshold Conditions, Resonant Frequencies, Laser Diode Structures and Radiation Patterns, Single Mode Lasers, Modulation of Laser Diodes, Temperature Effects, Light Source Linearity, Modal, Partition, and Reflection Noise.

Module-II

Detectors: (10 Hours)

PIN Photo-Detector, Avalanche Photodiodes, Photo-Detector Noise, Noise Sources, Signal-to-Noise Ratio, Depletion Layer Photocurrent, Response Time, Avalanche Multiplication Noise, Temperature Effects on Avalanche Gain, Photodiode Materials.

Module-III

Amplifiers and Switches: (10 Hours)

Optical Amplifiers, Semiconductor Laser Amplifiers, Fiber Amplifiers, Rare Earth Doped Fiber Amplifiers, Raman Fiber Amplifiers, Brillouin Fiber Amplifiers, Amplifier Gain, Noise Figure, Bandwidth, Photonic Switching, Integrated Optical Switches.

Module-IV

Connectors and Couplers: (8 Hours)

Cylindrical Ferrule Connector, Bi-Conical Ferrule Connectors, Double Eccentric Connectors, Duplex Fiber Connectors, Expanded Beam Connectors, Beam Splitter, Three Port Couplers, Four Port Couplers, Directional Couplers, Star Couplers, Lenses for Coupling Improvement.

Text Books:

1. Optical Fiber Communications by G. Keiser. 3rd Edition, Mc Graw Hill Book Co.
2. Fiber Optic Communications Technology by D. K. Mynbaev & Lowell L. Scheiner – Pearson Education.

Reference Books:

1. Optical fibers and Fiber Optic communication systems by Subir Kumar Sarkar , Publication : S. Chand & Co.
2. Fiber Optic communications By Joseph C. Palais 4th Edition , Pearson Publication Asia.

BEC (7TH SEM) Digital Image Processing Laboratory (0-0-3) Credit: 2

At least eight experiments from the following list to be done.

1) Study of digital image file formats
2) Linear convolution operation for blurring and smoothing of images
3) Image transforms like DFT, DCT, DST and Haar and their inverse transforms.
4) Morphology operations on gray images
5) Translation, Scaling and Rotation operations
6) Contrast stretching using linear and nonlinear methods.
7) Histogram computation, display and equalization operations
8) Edge preserving smoothing and image sharpening operations.
9) Image restoration using MMSE method to a blurred image.
10) High pass and Low pass filtering in frequency domain.
11) Image compression using K-L transform
12) Image affine transform
13) Run-length and quad-tree coding of binary images.
14) Pseudo- and false coloring of gray images.

BEC (7TH SEM) COMMUNICATION SYSTEMS LAB (0-0-3) Credit: 2

List of Experiments

(Experiment 1, 2, 3, 5, and 6 are compulsory. Do at least one from the rest.)

1. Radiation pattern of Horn Antenna at Microware frequency. (3 Hours)
2. Measurement of unknown impedance and matching at Microware frequency (6 Hours)
3. Study of Satellite Earth station and design of its Antenna to meet a given specification. (6 Hours)
4. Study of a Satellite Transponder of given specification and channel allocations CDMA facilities etc. (6Hours)
5. Measurement of Refractive Index profile, Numerical aperture
6. attenuation and dispersion in a multimode optical fiber . (9 Hours)
7. Establishing and Testing an optical Fiber Communication link (6 Hours)
8. Designing an optical fiber communication link to a give specification. (6 Hours)
9. Simulating TDM and WDM.

8th Semester

COMMUNICATION SYSTEM ENGINEERING -II (3-1-0)

Module I and II

Radar System (20 Hours)

Basic Principles of Radar, Range to a Target, Maximum Unambiguous Range, Radar Waveforms, Simple Form of Radar Equation, Radar Block Diagram, Radar Frequencies, Applications and Limitations of Radar, Doppler Frequency Shift, CW Radar, FMCW Radar, MTI and Pulse Doppler Radar, Sweep-to-Sweep Subtraction and the Delay Line Canceller, MTI Radar Block Diagram, High prf Pulse Doppler Radar, Medium prf Pulse Doppler Radar, Low prf Pulse Doppler Radar, Types of Tracking Radar Systems, Angle Tracking, Amplitude Comparison Mono pulse Radar, Phase Comparison Mono pulse Radar, Sequential Lobing, Conical Scan Radar.

Module III and IV

Television System (20 Hours)

Resolution, Aspect Ratio and Rectangular Scanning, Persistence of Vision and Flicker, Vertical Resolution, The Kell Factor, Horizontal Resolution and Video Bandwidth, Interlaced Scanning, Lines and Scanning, Blanking Signal, Horizontal Sync and Blanking Standards, Video Modulation and Vestigial Sideband Signals, Sound Modulation and Inter Carrier System, Standard Channel Characteristics, Television Broadcast Channels, Various TV Broadcasting Systems. Design Principle of TV Transmitters, Block Diagram of TV Transmitters, Block Diagram of Broadcast TV receiver and functional requirements of different stages of receiver, Mixing of Colour and Colour perception, Chromaticity Diagram, Colour TV Transmission and Reception Fundamentals. Introduction to CCTV, CATV, BIS, HDTV and Digital Television.

Text Books:

1. Introduction to Radar Systems by Merrill I. Skolnik, 3rd Edition, PHI Publications.
2. Television and Video Engineering by Arvind M. Dhake, 2nd Edition, TMH Publications.

MOBILE COMMUNICATION (3-1-0)

Module-I (12 Hours)

Cellular Concept & System Design:

Fundamentals: Frequency reuse, Channel Assignment, Handoff Strategies, Interferences and System Capacity, Trunking and grade of Service; Improving coverage and capacity in Cellular Systems – Cell splitting, Sectoring, Repeaters and Range Extension, Microcell & Picocell Zone Concept. Antennas for Base Station and hand held Cellular phone.

Module-II (10 Hours)

Mobile Radio Propagation : Large – Scale path loss, Ground Reflection Model, Diffraction, Scattering. Outdoor propagation Model – Okumura Model ; Indoor Propagation Model : Partition loses, Log distance Path loss Model. Small Scale Fading and Multipath, Doppler Shift. Types of small scale Fading and their effect on received signal.

Digital Modulation : л/4-QPSK, MSK and GMSK.

Module-III (10 Hours)

Spread Spectrum Techniques – DS-SS and FH-SS. Performances of FM, P/4QPSK & MSK in Fading and Interference.

Multiple Access Techniques :

Frequency Division Multiple Access (FDMA) , Time Division Multiple Access (TDMA), Spread Spectrum Multiple Access – Frequency Hopped Multiple Access (FHMA), Code Division Multiple Access (CDMA). Frequency and Channel specification for CDMA Digital Cellular Standards. Fundamentals of Equalization – adaptive Equalizer. Diversity Techniques –Space, Frequency, Polarization and Time Diversity.

Module-IV (10 Hours)

Global system for Mobile (GSM): features, architecture, channel types, Frame Structure in GSM. Signal processing in GSM. UWB signal transmission and UWB network organization:

Principles of UWB radio transmission and modulation (PPM, PAM and DS-UWB for Impulse Radio, OFDM for the multi-band approach), UWB channel modeling, receiver structures, Multi User Interference modeling, Localization, Network organization: advanced Medium Access Control and routing design strategies.

Text Books:

1. Wireless Communication, 2nd Edition by Theodore S. Rappaport, Pearson Publication.
2. Understanding Ultra Wide Band Radio Fundamentals, by Maria-Garbriella Di Benedetto, Guerino Giancola, Theodore S. Rappaport (Editor), Prentice Hall Communications Engineering and Emerging Technologies Series.

References Books:

1. Mobile Communication Engg., 2nd Edition by Willam C.Y.Lee Mc Graw Hill International Edition.
2. Mobile Cellular Communications, 2nd Edition by William C.Y.Lee Mc Graw Hill International Edition.
3. Mobile Communication, 2nd Edition by Jocken Schiller, Pearson Education.
4. Wideband Wireless Digital Communication by Andreas F.Molisch Editor Pearson Education .

8th Semester (Elective – III)

HIGH LEVEL VLSI DESIGN (3-1-0)

Module-I (10 Hours)

Basic concepts of hardware description languages., Hierarchy, Concurrency, logic and delay modeling, Structural, Data-flow and Behavioral styles of hardware description, Architecture of event driven simulators, Syntax and Semantics of VHDL, Variable and signal types, arrays and attributes, Operators, expressions and signal assignments, Entities, architecture specification and configurations, Component instantiation, Concurrent and sequential constructs, Use of Procedures and functions, Examples of design using VHDL., Synthesis of logic from hardware description. ;

Module-II (10 Hours)

CMOS Process and Masking Steps: Concept of Lambda, Design Rules, Layer Properties and Parasitic Estimation, Sheet Resistance, U Cg, Capacitance Ratio for Layers, Concept of tau, Quick estimation of delays. Design of Buffers and I/O Pads, CMOS Logic Design Styles and their Comparison, CMOS Logic Design Styles and their Comparison (Continued), From Specifications to Silicon, Abstraction Levels in VLSI Design. ;

Module-III (10 Hours)

Adder Architectures, Multiplier Architectures, Counter Architectures, ALU Architectures. Latches, Flip-flops, Registers and Register Files. PLA Design, Gate Array Approach, Standard Cell Approach. Moore and Mealy Machines, PLA-based Implementation, Random Logic Implementation, Micro-programmed Implementation (ROM-based Implementation)

Module-IV (10 Hours)

SRAM Cell, Different DRAM Cells, Arraying of Cells, Address Decoding, Read / Write Circuitry, Sense Amplifier Design, ROM Design. Clock Skew, Clock, Distribution and Routing, Clock Buffering, Clock Domains, Gated Clock, Clock Tree.

Text Books:

1. C. H. Roth, *Digital Systems Design Using VHDL* , Thomson Publications, Fourth Edition, 2002
2. V. A. Pedroni, *Circuit Design with VHDL*, MIT Press/PHI, 2004. (Cheap Edition)

Reference Books:

1. Z. Navabi, *Verilog Digital System Design*, Second Edition, Tata McGraw-Hill, 2008.
2. R. C. Cofer and B. F. Harding, *Rapid System Prototyping with FPGAs: Accelerating the Design Process*, Elsevier/Newnes, 200

8th Semester (Elective – III)

Telecommunication Switching And Computer Network: (3-1-0)

Module-I (10 Hours)

Introduction: Evolution, simple telephone communication, basics of switching systems, telecommunication networks.

Electronic space division switching: Stored program control, centralized and distributed SPC, software architecture, application software, enhanced software, two and three stage networks.

Module-II (10 Hours)

Time Division Switching: Basic time division space switching, basic time division time switching, time multiplexed space and time switching, combination switching, three-stage combination switching.

Module-III (10 Hours)

Traffic Engineering: Network traffic load and parameters, Grade of service, modeling switching systems, incoming traffic and Service Time Characterization.

Telephone Networks: Subscriber loop systems, switching hierarchy and routing, transmission plan, transmission systems, signaling techniques.

Module-IV (10 Hours)

Computer and Data Networks: Data transmission in PSTN, switching techniques, Data communication architecture, link-to-link layers, end-to-end layers, satellite based data networks, LAN, MAN, an overview of data network standards.

Integrated Service Digital Network: Motivation, new services, transmission channels, signaling, service characterization, broad band ISDN, voice data integration.

Text Books:

1. Telecommunication Switching Systems and Networks by Thiagarajan Viswanathan, PHI.

Reference Books:

1. Telecommunication Switching Systems and Networks by P.Gnanasivam,New age International.
2. W. Stallings, *Data and Computer Communications*, PHI, New Delhi, 2006
3. Data Communications and Networking - by Behrouz A Forouzan

8th Semester (Elective – III)

BIO-INFORMATICS(3-1-0)

Module-I (10 Hours)

1) Introduction: The biological sequence/structure deficit, Genome project, Pattern recognition and prediction, The folding problem, The role of chaperones, Sequence analysis, Homology and analogy.
2) Protein information resources: Biological databases, Primary sequences databases, Composite protein sequences databases, Secondary databases, Composite protein pattern databases, Structure classification databases.

Module – II (10 Hours)

3) Genome information resousces: DNA sequence databases, Specialized genomic resource.
4) DNA sequence analysis: Gene structure and DNA sequence, Feature of DNA sequence analysis, Issues in interpretation of EST search, Two approaches to gene hunting, The expression profile of a cell, cDNA libraries and ESTs, Different approaches to EST analysis, Effect of EST data on DNA databases.

Module – III (10 Hours)

5) Pairwise alignment techniques: Fatabase searching, Alphabets and complexity, Algorithms and programs, Comparing two sequences, Sub-sequences, Identity similarity, The dot plot, Local and global similarity, Global alignment, Local alignment, Dynamic programming, Pairwise database searching.
6) Multiple sequence alignment: The goal of multiple sequence alignment, the definition, The consensus, Computational complexity, Manual methods, Simultaneous methods, Progessive methods, Databases of multiple alignments, searching Databases of multiple alignments.

Module – IV (10 Hours)

7) Secondary database searching: Why bother with secondary database searches, What is in a secondary database?
8) Building a sequence search protocol: A practical approach, When to believe a result, Structural and functional interpretation.
9) Analysis packages: What is an analysis package?, Commercial database, Commercial software, Comprehensive packages, Package specializing in DNA analysis, Intranet Packages, Internet Packages, Laboratory Information Management Systems

Text Book:

1. Introduction to bio-informatics by T. K. Attwood, D. J. Parry-Smith and S. Fukan of Pearson Education Publication.

8th Semester (Elective – III)

ANTENNA ENGINEERING (3-1-0)

Module-I (14 Hours)

Antenna Definition,Principles of Radiation, Basic antenna parameters, Retarded Vector Magnetic Potential, Radiation field from Current element., Current Distribution on a thin Wire. Half wave dipole and Quarterwave monopole.

Two-element array. Principle of Pattern Multiplication. Linear Array. Broadside and end fire patterns, Balun.

Module-II (12 Hours)

Folded Dipole, Yagi Antenna. Frequency Independent Antenna. Log Periodic Dipole array,

Secondary Source and Aperture Antennas (Basics & applications).

Module-III (10 Hours)

Horn Antennas-Pyramidal & Sectoral Horn. Radiation Pattern and Gain of horn antenna.

Parabolic Reflector Antenna -Principle, analysis, Radiation Pattern and Gain.

Principles of Cassegrain Antenna.

Module-IV (08 Hours)

Microstrip Antenna – Basic Characteristics, Rectangular Patch, Radiation principle, Feeding Techniques,Cavity model.

Antenna Measurements – Radiation Pattern, Gain and Input Impedance.

Text Books:

1. Electromagnetic Wave and Radiating system by E. C. Jordan and K.G. Balmain, 2nd Edition, PHI Ch. 10, 11, 12, 13, 14, and 15.
2. Antennas Theory – Analysis and Design by C. Balanis, 2nd Edition, John Willey & Sons Selected portion Ch. 11, 12, 13, 15, and 16.

References Books:

1. Antenna Engineering by J. D. Krauss.
2. Antenna Engineering by W. L. Weeks.
3. Antennas and Wave Propagation by G. S. N. Raju, Pearson Education.
4. Antenna & Wave Propagation by R E. Collins.

8th Semester (Elective – IV)

INTELLIGENT INSTRUMENTATION (3-1-0)

Module-I (10 Hours)

SCIENCE OF MEASUREMENT

Units and Standards — Calibration techniques — Classification of errors — error analysis — statistical methods — odds and uncertainty — static and dynamic characteristics of transducers.

Module-II (10 Hours)

VARIABLE RESISTANCE , VARIABLE INDUCTANCE AND CAPACITANCE TRANSDUCERS

Potentiometer — strain gauge — resistance thermometer — hot wire anemometer — LVDT — variable reluctance transducers for measurement of dip and acceleration - Variable capacitive transducers —electro-magnetic, thermo-elastic, capacitor microphone.

Module-III (10 Hours)

PIEZOELECTRIC AND OPTICAL TRANSDUCERS:

Piezoelectric transducer — IC sensors — Piezo-resistive sensors, photoelectric, Hall-effect, Optical transducer-Principles — types and characteristics of fibres — fibre optic transducers for the measurement of force, temperature, flow and pressure.

INTERFACING CONVENTIONAL TRANSDUCERS WITH PC

Transducers with frequency output — digital transducers, interfacing with PC.

Module-IV (8 Hours)

SMART INSTRUMENTS

Smart/intelligent transducer — comparison with conventional transducers — self diagnosis and remote calibration features — smart transmitter with HART communicator —Micro Electro Mechanical Systems — sensors, actuators — principles and applications, nonlinearity compensation.

Text Books:

1. Barney G.C.V., Intelligent Instrumentation: Prentice Hall of India Pvt. Ltd., New Delhi, 1988.
2. D. Patranabis- Principle of Industrial Instrumentation,TMH,2000

References Books:

1. Doebelin, E.O., Measurement systems, McGraw Hill, Fourth edition, Singapore, 1990.
2. Chapman, P. Smart Sensors, ISA publication, 1995.

8th Semester (Elective – IV)

Advanced Communication System Engg.(3-1-0)

Module-I (12 Hours)

Review of Fundamental Concepts of Data communication.

Data-Link Protocol and Data communications Networks.

Data-link Protocol Function, character and bit Oriented Data Link Protocols, Asynchronous Data Link Protocols, Synchronous Data-link Protocols, Synchronous Data-Link control, High-Level Data Link control, Public Switched Data Networks, CCITTX.25, User-to-Network Interface Protocol. Integrated Services digital Network (ISDN). Asynchronous Transfer Mode(ATM). Local Area Networks . Ethernet.

Module-II (10Hours)

Digital T-Carriers and Multiplexing.

Time-Division Multiplexing (TDM); T1 Digital Carrier. North American

Digital Hierarchy. Digital Carrier Line Encoding. T Carrier Systems , Digital Carrier frame Synchronization. Bit Vrs Word Interleaving. Statistical TDM. Codecs and Combo Chips. FDM. AT & T's FDM Hierarchy. Composite Base band Signal. Formation of Master group. Wavelength Division Multiplexing (WDM).

Module-III (10 Hours)

Digital Cellular Telephone-Time Division Multiple Access (TDMA), Control Channel, Voice Channel, Speech Coding, Digital Modulation Scheme. Interim Standard95 (IS-95)-CDMA. Global System for Mobile Communication (GSM). Personal Satellite Communications System (PCSS). Iridium Satellite System.

Module-IV (8 Hours)

Microwave Radio Communications:

Microwave Radio Frequency assignments. Advantages and disadvantages of Microwave Radio. FM Microwave Radio System. Diversity. Protection Switching arrangements. Repeater Station. LOS Characteristics Microwave Radio System Gain.

Satellite Multiple Accessing Arrangement. FDM/FM Satellite Systems. FDMA, TDMA, CDMA. Global Positioning System (GPS).

Text Book:

1. Advanced Electronic Communication Systems Sixth Edition by Wayne Tomasi, Pearson Editor. Selected Education from 4,5,7,12 and 15.

References Book:

1. Wideband Wireless Digital Communication by Andreas F. Molisch- Editor, Pearson Education.

8th Semester (Elective – IV)
MOBILE COMPUTING (3-1-0)

Module-I (10 Hours)

Issues in Mobile computing, Over view of wireless telephony, Introduction to Personal Communications Services (PCS): PCS Architecture, mobility management, Networks signaling, Global system for Mobile Communication (GSM) System overview: GSM architecture, Mobility management, Network signaling.

General Packet Radio Services (GPRS): GPRS Architecture, GPRS Network Nodes, Mobile Data Communication; CDPD Networks, WLANs (Wireless LANs) - IEEE 802.II standard, Blue tooth, Mobile IP.

Module-II (12 Hours)

Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, Wireless mark up Languages (WML), 4G Mobile Services: Introduction to international Mobile Telecommunications 2000 (IMT 2000) Vision, Ultra Wideband Code division Multiple Access (UW-CDMA), Quality of services in 4G.

Module-III (8 Hours)

Wireless Enterprise Networks: Introduction to Virtual Networks. Data management issues – Data replication for mobile computers, Adaptive clustering for mobile wireless networks, Coda file system, Mobile computing with Rover toolkit, Transaction processing in mobile computing environment, Disconnected operations-Mobile agents.

Module-IV (10 Hours)

Server-side programming in Java, Pervasive web application architecture, Device independent example application. Adhoc Network – Routing protocol, Global state routing (GSR), Dynamic state routing (DSR), Fisheye state routing (FSR), Adhoc on demand distance vector (AODV), Destination sequenced Distance-vector routing (DSDV).

Text Books:

1. Mobile Computing, New Edition, by A. K. Talukdar, TMH.
2. Mobile Computing, New Edition, by Shambhu Upaddhaya, Kluwer Academic Publishers.

Reference Books:

1. “Pervasive Computing” , Burkhardt, Pearson.
2. “Mobile Communication”, J. Schiller, Pearson.
3. “The Wireless Application Protocol”, Sandeep Singhal, Pearson.
4. “Guide to Designing and Implementing Wireless LANs”, Mark Ciampa, Thomson learning, Vikas Publishing House,2001.
5. “The Wireless Application Protocol”, Sandeep Singhal , Pearson.

8th Semester (Elective – IV)

CRYPTOGRAPHY AND NETWORK SECURITY: (3-1-0)

Module-I (10 Hours)

Introduction To The Concepts Of Security

Introduction, the Need for Security, Security Approaches, Principles of Security, Types of Attacks.

Cryptographic Techniques:

Introduction, Plain Text and Cipher Text, Substitution Techniques, Transposition Techniques, Encryption and Decryption, Symmetric and Asymmetric Key Cryptography, Steganography, Key Range and Key Size, Possible Types of Attacks.

Module-II (10 Hours)

Computer Based Symmetric Key Cryptographic Algorithms:

Introduction, Algorithm Types and modes, An Overview of Symmetric Key Cryptography, Data Encryption Standard (DES), International Data Encryption Algorithm (DEA), RC5, Blowfish, Advanced Encryption, Standard (AEC), Differential and Linear Cryptanalysis.

Computer Based Asymmetric Key Cryptographic Algorithms:

Introduction, Brief history of Asymmetric Key Cryptography, An Overview of Asymmetric Key Cryptography, the RSA Algorithm, Symmetric and Asymmetric Key Cryptography Together, Digital Signatures, Knapsack Algorithm, Some other Algorithms.

Module-III (10 Hours)

Public Key Infrastructure :

Introduction, Digital Certificates, Private Key Management, the PKIX,

Public Key Cryptography Standards (PKCS) XML, PKI and Security.

Internet Security Protocols:

Basic Concepts, Secure Socket Layer (SSL), Secure Hyper Text Transfer Protocols (SHTTP), Time, Stamping Protocol (TSP), Secure Electronic Transaction (SET), SSL versus SET, 3-D Secure Protocol, Electronic money Email Security, Wireless Application Protocol (WAP), Security in GSM.

Module-IV (10 Hours)

User Authentication Mechanisms:

Introduction, Authentication Basics, Passwords, Authentication Tokens, Certificate-based Authentication, Biometric Authentication, Kerberos, Single Sign On (SSO) Approaches.

Network Security:

Brief Introduction to TCP/IP, Firewalls, IP Security, Virtual Private Networks (VPN)

Text Books:

(1) Cryptography and Network Security by A. Kahate,TMH publication
(2) Cryptography and Network Security by William Stalling,

8th Semester (Elective – IV)
LOW POWER VLSI DESIGN (3-1-0)

Module-I (10 Hours)

Introduction: Need for low power VLSI chips, Sources of power dissipation on Digital Integrated circuits. Emerging Low power approaches, Physics of power dissipation in CMOS devices. Device & Technology Impact on Low Power: Dynamic dissipation in CMOS, Transistor sizing & gate oxide thickness, Impact of technology Scaling, Technology & Device innovation Power estimation, Simulation Power analysis: SPICE circuit simulators, gate level logic simulation, capacitive power estimation, static state power, gate level capacitance estimation, architecture level analysis, data correlation analysis in DSP systems, Monte Carlo simulation. Probabilistic power analysis: Random logic signals, probability & frequency, probabilistic power analysis techniques, signal entropy.

Module-II (10 Hours)

Low Power Design: Circuit level: Power consumption in circuits. Flip Flops & Latches design, high capacitance nodes, low power digital cells library Logic level: Gate reorganization, signal gating, logic encoding, state machine encoding, pre-computation logic 7.

Module-III (10 Hours)

Low power Architecture & Systems: Power & performance management, switching activity reduction, parallel architecture with voltage reduction, flow graph transformation, low power arithmetic components, low power memory design.Low power Clock Distribution: Power dissipation in clock distribution, single driver Vs distributed buffers, Zero skew Vs tolerable skew, chip & package co design of clock network

Module-IV (10 Hours)

Algorithm & architectural level methodologies: Introduction, design flow, Algorithmic level analysis & optimization, Architectural level estimation & synthesis.

Text Books:

1. Gary K. Yeap, “Practical Low Power Digital VLSI Design”, KAP, 2002

2. Kaushik Roy, Sharat Prasad, “Low-Power CMOS VLSI Circuit Design” Wiley, 2000

Reference Books:

1. Rabaey, Pedram, “Low power design methodologies” Kluwer Academic, 1997

2. Low Power Design in Deep Sub-micron Electronics by W. Nebel and J. Mermet, Kluwer Academic Publishers, 1997