List of Elective
ELECTRONICS & COMMUNICATION ENGG.

ELECTIVE – I

1. TEC 011 Digital System Design Using VHDL
2. TEC 012 Fundamentals of Radar & Navigation
3. TEC 013 Artificial Neural Networks
4. TEC 014 Speech Processing

ELECTIVE – II

1. TEC 021 Principles of Secure Communication
2. TEC 022 Spread Spectrum Systems
3. TEC 023 Filter Design
4. TEC 024 Satellite Communication

ELECTIVE – III

1. TEC 031 Embedded Systems
2. TEC 032 Adaptive Signal Processing
3. TEC 033 Reliability and Quality Management
4. TEC 034 Biomedical Signal Processing

ELECTIVE – IV

1. TEC 041 Random Signal Theory
2. TEC 042 VLSI Design
3. TEC 043 Optical Networks
4. TEC 044 Digital Image Processing

TEC-701 OPTICAL FIBER COMMUNICATION

Unit	Topic	Text Book	Lectures
1	1. Introduction: Block diagram of optical fiber communication system, Advantages of optical fiber communication 2. Optical fiber waveguides: structure of optical wave guide, light propagation in optical fiber using ray theory, acceptance angle, numerical aperture, skew rays, wave theory for optical propagation, modes in a planar and cylindrical guide, mode volume, single mode fibers, cutoff wavelength, mode field diameter, effective refractive index and group and mode delay factor for single mode fiber.	1/1 1/2	1 7
2.& 3	3. Transmission Characteristics of Optical fiber, Attenuation in optical fibers, intrinsic and extrinsic absorption, linear and non linear scattering losses, fiber bend losses. Dispersion and pulse broadening,	1/3	5

	intramodal and intermodal dispersion for step and graded index fibers, modal noise, over all fiber dispersion for multimode and monomode fiber, dispersion shifted fibers, modal birefringence and polarization maintaining fibers		
	4. Optical Sources: Basic concepts Einstein relations and population inversion optical feedback and threshold conditions, direct and indirect band gap semiconductors spontaneous and stimulated emission in p-n junction, threshold current density, Hetero junction & DH structure, semiconductor injection lasers structure & Characteristics of injection laser. Drawback and advantages of LED, DH, LED, LED structures and characteristics	1/6 1/7	5 3
	5.Optical detectors: Requirement for photo detections p-n photodiode, characteristics of photo detections, p-i-n and avalanche photodiodes, phototransistors & photoconductors	1/8	4
4 & 5	6. Direct detection receiver performance considerations: Noise sources in optical fiber communication, noise in p-n, p-i-n and APD receivers, Receiver structures.	1/9	3
	7. Optical fiber communication systems: Principal components of an optical fiber communication system, source laminations, optical transmitter circuits, LED and laser drive circuits, optical receiver block diagram, simple circuits for pre-amplifier, automatic gain control and equalization, Regenerative repeater, BER of optical receiver, channel losses, ISI penalty and optical power budgeting for digital optical fiber system, line coding, analog systems, Direct intercity and sub carrier intensity modulation using AM, FM and PM. Block diagram and detection principle of coherent optical fiber system.	1/11 1/12	10 3

Text / Reference Books:

Text Book:

1. Optical fiber Communication: John M.S Senior PHI, 2nd Ed.

Reference Books:

1. Optical Communication: J. Gowar PHI, 2nd Ed.
2. Optical fiber Communication: G.E. Keiser Mc Graw-Hill, 3rd Ed.
3. Optoelectronics: Wilson & Hawkes PHI, 2nd Ed.

TEC-702 ELECTRONIC SWITCHING

Unit	Topic	Text Book	Lectures
1 & 2	1. Introduction: Message switching, circuits switching, functions of a switching system, register-translator-senders, distribution frames, crossbar switch, a general trunking, electronic switching, Reed electronic system, digital switching systems.	2/3	3
	2. Digital switching: Switching functions, space division switching, multiple stage switching, nonblocking switches, blocking probabilities, Lee graphs and Jacobaeus, foulded four wire switches, path dinding, switch matrix control; Time division switching,	3/5	13

	analog and digital time division switching, a digital memory switch, time stage in general, two dimensional switching, implementation complexity of TD switches, multiple stage time and space switching, STS switching , TST switching, TSSST switches, No.4 ESS Toll switch, System 75 digital PBX, Digital cross connect systems, Consolidation and segregation, DCS hierarchy, integrated cross connect equipment, digital switching in analog environment, zero loss switching.		
3.	3. Telecom Traffic Engineering: Network traffic load and parameters, grade of service and blocking probability, modeling switching systems, Markov processes, birth-death processes, incoming traffic and service time characteristics, Poisson arrival process, holding time of calls, blocking models and loss estimates, lost calls cleared systems with infinite and finite subscribers, lost calls returned systems and lost calls held system, Delay systems and Erlang C formula.	1/8	8
4 & 5	4. Control of Switching Systems: Call processing functions, sequence of operations, signal exchanges, state transition diagrams; common control, Reliability availability and security; Stored program control, processor architecture, centralized SPC, distributed SPC, Level3, Level2 and Level-1 processing, SPC software, system software and Language processor, SDL, application software.	2/7, 1/3 &1/4	5
	5. Signalling : Customer line signalling, AF junctions and trunk circuits, outband and inband signalling, PCM and inter register signalling, Common channel signaling, general principles and network, CCITT signaling system No. 6 and 7, HDLC protocol, Signal units, the signaling information field.	2/8	6
	6. Packet Switching: Packets formats, statistical multiplexing, routing control, dynamic, virtual path circuit and fixed path routing, flow control, X.25 protocol, frame relay, TCP/IP, ATM cell, ATM service categories, ATM switching , ATM memory switch, space memory switch, memory-space, memory-space-memory switch, Banyan network switch.	3/10	5

Text / Reference Books:

1. Telecommunication switching System and networks, Thiagarajan Viswanathan, PHI.
2. Telecommunication switching, Traffic and Networks, J.E. Flood, Pearson education.
3. Digital Telephony, J.C. Bellamy, John Wiley, 3rd ed.
4. Principles of Communication Systems, Taub and Schilling, TMH

TEC 751 Communication Lab III

Experiments on Optical Fiber Communication

1. Setting up fiber optics analog Link and verification through voice signal transmission.
2. Study of losses in optical fiber.
3. Setting up fiber optic digital link.
4. Transmission of TDM signal using fiber optic digital link

5. To establish PC to PC communication link using optical glass fiber & RS 232 interface

Experiments based on MATLAB

1. Use of Monte Carlo Simulation estimate and plot error probability for a binary communication system employing matched filter.
2. Implement an adaptive equalizer based on LMS algorithm and study the effect of step size on MSE.
3. Perform Monte-Carlo simulation of a 4PSK Communication system and determine and plot symbol and bit error rates.
4. Perform Monte- Carlo simulation of four phase DPSK system and plot symbol error rate.
5. Determine the error probability for orthogonal signalling using MATLAB employing (a) Hard Decision (b) Softdecision decoding.
6. Find the output of a convolution encoder for a given input sequence using MATLAB.

College may add four more experiments in the above list.

TEC 801 Wireless Communication

Unit	Topic	Lectures
I	Evolution of mobile radio communication fundamentals. Large scale path loss: propagation models, reflection, diffraction, scattering, practical link budget design using path loss model. Small scale fading & multipath propagation and measurements, impulse response model and parameters of multipath channels, types of fading, theory of multi-path shape factor for fading wireless channels.	10
II	Spread spectrum modulation techniques: Pseudo-noise sequence, direct sequence spread spectrum (DS-SS), frequency hopped spread spectrum(FH-SS), performance of DS-SS, performance of FH-SS, modulation performance in fading and multipath channels, fundamentals of equalisation, equaliser in communication receiver, survey of equalisation techniques, linear equaliser, linear equaliser, non-linear equalisation, diversity techniques, RAKE receiver.	7
III	Characteristics of speech signals, quantisation techniques, vocoders, linear predictive coders, time division multiple access, space division multiple access, and frequency division multiple access.	8
IV & V	Frequency reuse, channel assignment strategies, handoff strategies, interference and system capacity, improving coverage and capacity in cellular systems. Introduction to wireless networks, 2G, 3G wireless systems, wireless standards.	15

Text Book:

1. T.S. Rappaport, “Wireless Communication-Principles and practice”, Pearson

Reference Books:

1. Willium C. Y. Lee, “Mobile communication Design and fundamentals”
2. D. R. Kamilo Fehar, “Wireless digital communication”
3. Haykin S & Moher M., “Modern wireless communication”, Pearson, 2005.

4. R. Pandya, " Mobile and personal communication system", PHI.

TEC - 802 Data Communication Networks

Unit	Topic	Lectures
I	INTRODUCTION: Network structure, network architectures. The OSI reference model, services, standardization, Other architectures, Connection oriented and connection less services, example networks. The Physical Layer: Transmission media, EIA RS-232C, EIA RS-449. Pulse code modulation. FDM & TDM. Circuit switching. Packet switching. Hybrid switching. Polling. CCITT X.21. Ethernet.	11
II	The Data Link Layer: Basic link protocols. Character oriented and bit oriented protocols. The ALOHA protocols. IEEE standard 802 for LAN, framing, Error control, Flow control.	7
III	The Network Layer: Design Issues. Routing Algorithms. Congestion control Algorithms. Subnet concept, Virtual circuit and Data gram Subnet, Flow control, Internetworking, Bridges, Routers, Gateways and different level switches.	7
IV & V	The Transport Layer: Design Issues. Connection management. Study of Internet and ATM transport layer protocols. Internet Issues: Principles of bridges and routers. The TCP/IP Protocol suite: Overview of TCP/IP. Addressing, Subnetting and network layer protocols. Application layer services: DNS, DHCP, FTP, TFTP, SMTP, SNMP, HTTP, WWW.	11

References:

1. Andrew S. Tanenbaum: Computer Networks, PHI India.
2. Leon-Garcia,Widjaja: Communication Networks, TMH.
3. Forouzan: Data Communications & Networking, TMH.
4. William Stallings: Data & Computer Communication, Prentice Hall.

TEC - 011 Digital System Design Using VHDL

Unit	Topic	Text/Chapter	Lectures
I	**INTRODUCTION TO VHDL:** VHDL description, combinational networks, modeling flip flop using VHDL, VHDL model for multiplexer, comliance and simulation of VHDL, codes, modeling a sequential machine, variables, signals and constants, arrays VHDL operators, VHDL functions, VHDL procedures, packages and libraries, VHDL model for a counter. **ADVANCED VHDL:** Attributes, transport and inertial delays, operator over loading, multi valued logic and signal resolution, IEEE-1164, standard logic, generic, generates statements, synthesis of VHDL codes, synthesis examples, file handling and TEXTIO.	1/ 2,8	10
II	**DESIGN OF NETWORKS FOR ARITHMATIC OPERATIONS:** Design of serial adder with accumulator, state graph for control networks design of binary multiplier, multiplication of signed binary	1/ 4,5	10

	numbers, design of binary divider. **DIGITAL DESIGN WITH SM CHART:** state machine charts, derivation of SM charts, realisation of SM charts, implementation of dice game, alternative realisation of SM charts using microprogramming, linked state machine.		
III	**FLOATING POINT ARITHMETIC:** Representation of floating point numbers, floating point multiplication, other floating point operations. **DESIGNING WITH PROGRAMMABLE GATE ARRAYS AND COMPLEX PROGRAMMABLE LOGIC DEVICES:** Xinx 3000 series FPGAs, Xinx 4000 series FPGAs, using one hot state assignment.	1/ 6,7	8
IV	**MEMORY MODELS FOR MEMORIES AND BUSES:** Static RAM, a simplified 486 bus model, interfacing memory to microprocessor bus.	1/9	6
V	**DESIGN EXAMPLES:** UART design, description of MC68HC05 microcontroller, design of microcontroller CPU, complete microcontroller design.	1/10	6

Text Book:

1. Charles H Roth Jr, "Digital System Design using VHDL", Thomson Learning, 2002.

Reference Books:

2. Stephen Brown & Zvonko Vranesic, "Fundamentals of digital logic design with VHDL", TMH, 2nd Ed., 2007.
3. Jhon F Wakerly, "Digital design", PHI, 4th Ed.

TEC – 012 Fundamentals of Radar and Navigation

Unit	Topic	Book/ chapter	Lectures
I & II	RADAR SIGNAL MODELS: Amplitude models, distributed target forms of range equation, radar cross section, statistical description of radar cross section, Swerling model, Clutter, signal to clutter ratio, temporal and spatial correlation of clutter, noise model and signal to noise ratio, frequency models, Doppler shift, simplifies approach to Doppler shift, stop and hop assumption, spatial model, variation with angle, variation with range, projections, multipath, spectral models.	1/ 2	10
	RADAR WAVE FORMS: Waveform matched filter of moving targets, ambiguity function, ambiguity function of the simple matched pulse filter for the pulse burst, pulse by pulse processing, range ambiguity, Doppler response and ambiguity function of the pulse burst.	1/ 4	6
III	DETECTION FUNDAMENTALS: Radar detection as hypothesis testing, Neyman-Pearson detection rule, likelihood ratio test, threshold detection of radar signals, non-coherent integration of non-fluctuating targets, Albersheim and Shnidaman equations, Binary integration.	1/6	8
IV	RADIO DIRECTION FINDING: loop direction finder, goniometer, errors in direction finding, adcock and automatic direction finders, commutated aerial direction finder.	2/2	4
	RADIO RANGES: LF/MF four course radio range, VOR, ground equipment & receiver, VOR errors.	2/3	4

	HYBERBOLIC SYSTEM OF NAVIGATION: LORAN Decca & Omega system. DME & TECAN	2/4 2/5	2 2
V	AIDS TO APPROACH AND LANDING: ILS, GCA & MLS DOPPLER NAVIGATION: Beam configuration, doppler frequency equation, track stabilisation and doppler spectrum, components of doppler navigation system, doppler radar equipment, CW & FMCW Doppler radar, frequency trackers, doppler range equation. SATALLITE NAVIGATION SYSTEM: transit system, NAVSTAR, GPS, basic principles of operation, signal structure of NAVSTAR broadcasts, data message, velocity determination, accuracy of GPS & differential navigation, NAVSTAR receiver.	2/6 2/7 2/9	3 3 4

Text and reference books:

1. Fundamentals of radar signal processing, Mark A Richards, TMH.
2. Elements of Electronics Navigation, N. S. Nagraja, TMH.
3. Radar principles, Peebles Jr. P. Z., Wiley, NY.

TEC – 013 ARTIFICIAL NEURAL NETWORKS

Unit	Topic	Text Book/ Chapter	Lectures
1	**Introduction** Introduction and history, human brain, biological neuron, models of neuron, signal flow graph of neuron, feedback, network architecture, knowledge representation, Artificial intelligence and neural networks. **Learning Process** Error correction learning, memory based learning, Hebbian learning, competitive learning, Boltzmann learning, learning with and without teacher, learning tasks, memory, adaptation.	 1/1 1/1	 4 4
2 & 3	**Artificial neurons, Neural networks and architectures** Introduction, neuron signal function, mathematical preliminaries, Feedforward & feedback architecture. **Geometry of Binary threshold neurons and their networks** Pattern recognition, convex sets and convex hulls, space of Boolean functions, binary neurons for pattern classification, non linear separable problems, capacity of TLN, XOR solution. **Perceptrons and LMS** Learning objective of TLN, pattern space & weight space, perceptron learning algorithm, perceptron convergence theorem, pocket algorithm, α – LMS learning, MSE error surface, steepest descent search, μ – LMS and application. **Backpropogation and other learning algorithms**	2/3 2/4 2/5 2/6	2 3 5 5

	Multilayered architecture, backpropagation learning algorithm, practical considerations, structure growing algorithms, applications of FFNN, reinforcement learning.		
4	**Statistical Pattern Recognition** Bayes' theorem, classical decisions with bayes' theorem, probabilistic interpretation of neuron function, interpreting neuron signals as probabilities, multilayered networks & posterior probabilities, error functions for classification problems. **RBF Networks** Regularization networks, generalized RBF networks, RBF network for solving XOR problem, comparison of RBF networks & multilayer perceptrons. **Stochastic Machines** Statistical mechanics, simulated annealing, Boltzmann machine.	2/7 1/5 1/11	4 2 2
5	**Adaptive Resonance Theory** Building blocks of adaptive resonance, ART 1. **Self Organizing Feature MAP** Introduction, Maximal eigenvector filtering, principal component analysis, generalized learning laws, competitive learning, vector quantization, maxican hat networks, SOFM, applications of SOFM. Fuzzy sets, Fuzzy systems and applications, neural networks and fuzzy logic,	2/11 2/12 2/13, 2/14	1 6 2

Text Books

1. Simon Haykin, "Neural Networks,", Pearson Education 2nd edition.
2. Satish Kumar, "Neural Networks," Tata McGraw-Hill.

Reference Books

1. Jack M. Zurada, " Introduction to Artificial Neural System," Jaico Publishing House.
2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications," McGraw-Hill Inc.

TEC-014 SPEECH PROCESSING

Unit	Topic	Text Book	Lectures
1.	1. Digital models for speech signals: Mechanism of speech production & acoustic phoenetics, the acoustic theory of speech production, lossless tube models, and digital models for speech signals.	1/3	10

2.	2. Time Domain methods of speech sampling: Time dependent processing of speech, short time energy and average magnitude, short time average zero crossing rate, discrimination between speech& silence, pitch period estimation using parallel processing, short time autocorrelation function & AMDF, pitch period estimation using autocorrelation function.	1/4	10
3 & 4	3. Short time Fourier Analysis: Definition and properties, design of filter banks, implementation of filter bank summation method using FFT, spectrographic displays, pitch detection, analysis by synthesis phase, vocoder and channel vocoder . 4. Homomorphic speech processing: Homomorphic system for convolution, complex cepstrum of speech, pitch detection using Homomorphic processing, formant estimation, Homomorphic vocoder.	1/6 1/7	10 6
5.	Linear Predictive Coding of Speech: Basic principles of linear predictive analysis, the autocorrelation method, computation of the gain for the model, solution of LPC equations for auto correlation method, prediction error and normalized mean square error, frequency domain interpretation of mean squared prediction error relation of linear predictive analysis to lossless tube models, relation between various speech parameters, synthesis of speech from linear predictive parameters, application of LPC parameters.	1/8	10

Text / Reference Books:

1. Digital Processing of speech signals by R.L. Rabiner & R.W. Schafer, Pearson Education.
2. Voice processing by G.E. Pelton, McGraw –Hill.
3. Speech Analysis, synthesis and perception by J.L. Flanagan, Springer-Verlog. N. Y.
4. Diserete time speech signal Processing: Principles and Practices by Jhomas Quatieri, Pearson Education.

TEC-021 PRINCIPLES OF SECURE COMMUNICATION

Unit	Topic	Text Book	Lectures
1& 2	**1. Direct Sequence Spread Spectrum Systems:** Model of SS digital communication system, direct sequence spread spectrum signal, error rate performance of the decoder, processing gain and jamming margin, uncoded DSSS signals, applications of DSSS signals in anti-jamming, low detectability signal transmission, code division multiple access and multipath channels, effect of pulsed interference on DSSS systems, Generation of PN sequences using m sequence and Gold sequences, excision of narrowband interference in DSSS systems, acquisition and tracking of DSSS system.	1/8	10

	2. Frequency Hopped Spread Spectrum Systems: Basic concepts, slow and fast frequency hopping, performance of FHSS in AW GN and partial band interference, FHSS in CDMA system, Time hopping and hybrid SS system, acquisition and tracking of FH SS systems.	1/8 & 3/9	6
3 & 4	**3. Cryptographic Techniques :** Classical encryption technique, Symmetric cipher model, cryptography and cryptanalysts, Substitution techniques, transposition techniques **4. Block Cipher and Data Encryption Standard :** Block cipher principle, data encryption standard (DES) strength of DES, differential and linear cryptanalysts, block cipher design principles, simplified advanced encryption standard (S-AES), multiple encryption and triple DES, Block cipher modes of operation, stream ciphers and RC_4 algorithm.	2/2 2/3,2/5 & 2/6	3 13
5.	**5. Public Key Cryptography:** Prime numbers, Fermat and Euler's theorem, Chinese remainder theorem, discrete algorithms, principles of public key cryptosystems, RSA algorithm, key management Diffie-Hellman key exchange, message authentication requirements and functions.	2/8 & 2/ 9, 2/10 & 2/11	10

Text / Reference Books:

1. Digital Communication by J.G. Proakis McGraw Hill 2nd Ed.
2. Cryptography and Network Security by W. Stallivgs 4th Ed., PHI
3. Digital Communication by Simon Haykin, Wiley.
4. Principle of Communication systems by Taub & Schilling TMH.
5. Cryptography and secure Communications by M.Y. Rhee, Mc Graw Hill

TEC- 022 Spread Spectrum Systems

Unit	Topic	Text Book/ Chapter	Lectures
I	Introduction to spread spectrum, spread spectrum techniques, Direct sequence system, frequency hopping systems, pulse FM(chirp) system, hybrid systems.	1/1,2	5
II	Coding for communication and ranging- Property of codes for spread spectrum, Autocorrelation and cross correlation of codes, composite codes, code selection and signal spectra, error detection and correlation codes.	1/3	10
III	Modulation and demodulation – Balance modulator, quadriphase modulator, frequency synthesis for spread spectrum modulation, in line and heterodyne correlation, base band recovery, phase lock loop, costas loop, FM	1/4	10

	feedback, PDM and FH demodulators		
IV	Need for synchronization, types of synchronizers, RF link- Noise figure, cochannel users, dynamic range and AGC, propagation medium, overall transmitter and receiver design.	1/7	10
V	Test and evaluation of spread spectrum system- selectivity, sensitivity, jamming margin, synch acquisition, processing gain. Transmitter measurements.	1/10	05

Text Book: R. C. Dixen, "Spread spectrum systems with commercial application", Jhon Wiley, 3rd Ed.

Reference Book: H. Taube and D. L. Schilling, "Priciples of Communication systems", Tata Mc Graw Hill, 2nd Ed. Reprint 2007.

TEC 023 Filter Design

Unit	Topic	Book
1	Review of op-amps circuits, Categorization of filters-Low-pass filter, High-pass filter, band-pass filter, band-reject filter, Gain equalizers, and Delay equalizers.	1
2	Approximation Theory: Butterworth approximation, Chebyshev approximation, Inverse Chebyshev approximation, Basic of sensitivity, Frequency Transformations.	1
3	Three amplifier Biquad: Basic low pass and band pass circuit, realization of the general Biquadratic Functions, summing of four Amplifier biquad, feed forward three amplifier biquad, Passive Ladder structures, Inductor Substitution using Gyrator, Transformation of elements using the FDNR.	1
4	Elementary transconductor building blocks, resistors, integrators, amplifiers, summers, gyrator, First and second order filters, higher order filters.	2
5	Switched capacitor filters: The MOS switch, The switched capacitor, first order building blocks, second order sections, sampled data operation, Switched capacitor first and second order filters, Bilinear transformation.	2

Text Book:
[1] Gobind Daryanani, "Principles of active network synthesis and design",John Wiley and Sons.
[2. R.Schaumann, M.E.Van Valkenburg, "Design of analog filters", Oxford University Press.

TEC 024 SATELLITE COMMUNICATION

Unit	Contents	Book/ Chapter	No. of Lect.
I	Elements of Satellite Communication Orbital mechanics, look angle and orbit determination, launches & launch vehicle, orbital effects, Geostationary Orbit.	02 / 01 02/ 02-03	6
II	Satellite subsystems, attitude and orbit control systems, TTC&M, communication subsystem, satellite antenna satellite link design: basic transmission theory, system noise temperature and G/T ratio, downlink design, uplink design, satellite systems using small earth station, design for specified C/N.	01 / 03 01 / 04	10
III	Modulation and multiplexing techniques for satellite links: FM, pre-emphasis and de-emphasis, S/N ratios for FM video transmission, digital transmission, digital modulation and demodulation, TDM. Multiple access: FDMA, TDMA, DAMA and CDMA.	01 / 05 01 / 06, 02/14	8
IV	Error control for digital satellite links: error detection and correction, channel capacity, error control coding, convolutional codes, linear and cyclic block codes. Propagation effects and their impact on satellite-earth links: attenuation and depolarization, atmospheric absorption, rain, cloud and ice effects etc.	01 / 07 01 / 08	08
V	Introduction of various satellite systems: VSAT, low earth orbit and non-geostationary, direct broadcast satellite television and radio, satellite navigation and the global positioning systems.	01	08

Text / Reference Books:

1. Satellite Communications / Pratt, Bostian, Allnutt / John Wiley & Sons.
2. Satellite Communications / Dennis Roddy / McGraw-Hill
3. Digital Satellite Communications/ Tri T. Ha./ McGraw-Hill.

TEC-031 Embedded System

Unit	Topic	Lectures	Book/ Chapter
1.	1. Introduction: Embedded systems and its applications, Embedded Operating system, Design parameters of an embedded system and its significance, design life cycle, tools introduction, hardware and software partitioning and co-design	3	1/1
	2. Hardware Fundamentals for the embedded developers Digital circuit parameters-	2	3/2 &3

	Open collector outputs Tristate outputs I/O sinking and Sourcing, PLD's, Watchdog Timers, Hardware design and development.		
	3. Custom Single Purpose Processors: Optimizing program, FSMD, Data path & FSM.	2	1/2
	4.General purpose processors and ASIP's (Application Specific Instruction set Programming): Software and operation of general purpose processors-Programmers View Development Environment-ASIPs Microcontrollers-DSP Chips.	4	1/3
2 & 3	5. Introduction to Microcontrollers and Micoprocessors, Embedded versus external memory devices, CISC and RISC processors, Harvard and Von Neumann Architectures.	2	2/1
	6. 8051 Microcontrollers-Assembly language, architecture, registers, Addressing modes, Instruction set, I/O ports and memory organization Interrupts Timer/counter and serial communication.	15	2/3, 4,5,&6
4	7. RTOS-Tasks, states, Data, Semaphores and shared data, Operating system services, Message queues, Mailboxes.	5	3/7 & 7
	8.Advanced Processor-(only architectures) 80386, 80486 and ARM (References)	2	
5.	9. Communication basics, Microprocessor Interfacing I/O Addressing, Direct memory access, Arbitration, multilevel bus architecture, Serial protocols, Parallel protocols and wireless protocols.	4	1/6
	10. Real world Interfacing: LCD, Stepping Motor, ADC, DAC, LED, Push Buttons, Key board, Latch Interconnection, PPI.	6	2/12

Text Books:

1. Embedded System Design-Frank Vahid/Tony Givargis, John Willey@2005.
2. Microcontroller (Theory and Applications) Ajay V Deshmukh, Tata McGraw-Hill@2005.
3. An Embedded Software Primer-David E.Simon, Pearson Education @ 1999.

References:

1. The 8051 Microcontroller and embedded systems-Muhammad Ali Mazidi and Janice Gillispie.
2. Microcontrollers (Architecture, Implementation & Programming) Kenneth Hintz, Daniel Tabak, Tata McGraw-Hill@2005.
3. 8051 Microcontrollers & Embedded Systems 2nd Edition-Sampath Kr, Katson Books@2006.

TEC-032 ADAPTIVE SIGNAL PROCESSING

Unit	Topic	Text Book / Chapter	Lectures
1 & 2	1. Introduction: Definition and characteristics, general properties open and closed loop adaptation.	1/1	1
	2. Adaptive Linear Combiner: General description, input signal and Weight vectors, desired response and error performance function, gradient and minimum mean square, alternative definition of gradient, decorelection of error and input	1/2	3

	components.		
	3. Theory of Adaptation with Stationary Signals: Input correlation matrix, Eigenvalues and eigenvectors of the correlation matrix, and their geometrical significance. Basic ideas of gradient search methods, gradient search by newton's method and method of steepest descent, gradient component estimation by derivative measurement, effects of gradient noise, on weight vector solution, excess MSE, time constant and misadjustment, performance comparison of Newton and S.D. methods.	1/3,1/4 & 1/5	12
3	4. Adaptive Algorithms: Least mean square algorithm, convergence, learning curve noise in Weight vector misadjustment and performances of LMS algorithms, sequential regression algorithm, adaptive recursive LMS algorithm, random search algorithm.	1/6, 1/8	8
4 & 5	5. Recursive Least Square Algorithm: Preliminaries, matrix inversion lemma, exponentially weighted RLS algorithm, update recursion for the sum of weighted error squares, convergence analysis of RLS algorithm 6. Adaptive Filter Structures: Lattice structures, all poles and all zeroes versions, adaptive lattice predictor. Lattice LMS algorithms, and lattice SER algorithms, adaptive filters with orthogonal signals, DFT and lattice preprocessors. 7. Adaptive Filter Applications: (i) Adaptive modeling and systems identification. (ii) Inverse adaptive modeling, equalization and deconvolution	2/9 1/8 1/9 & 1/10	5 6 8

Text Books:

1. Adaptive Signal Processing, Widrow and Stearns, Pearson Education
2. Adaptive Filter Theory, Simon Haykin, Pearson Education

Reference Books

1. Adaptive Filters, Cowan & Grant, Prentice Hall
2. Theory and design of adaptive filters, John R. Treichler, PHI.
3. Adaptive Signal Processing by Davisson.

TEC-033 Reliability & Quality Management

Unit	Contents	Book/ Chapter	No. of Lectures
I	Introduction: Definition of reliability, quality, availability, maintainability, types of failures, various parameters of system effectiveness, concept of failure modes, difference between MTTR and MTTF.	01 / 01	06
II	Reliability mathematics: Classical set theory, Boolean algebra, sample space, definition of probability, basic properties of	01 / 02	08

	probability, conditional probability, and random variables. Probability distribution: Exponential distribution, gamma distribution, binomial distribution, normal distribution and weibull distribution.		
III	Reliability Data Analysis: The reliability function, bathtub curve, data collection, storage & recovery of data, component reliability from test data, linear hazard model & exponential hazard model. System Reliability: Systems with components in series, systems with components in parallel, series –parallel systems, Fault tree techniques, K-out of m systems.	02 / 05	08
IV	Electronics System Reliability: Reliability of electronic components, component types and failure mechanics, circuit and system aspects, reliability of electronic system design, parameter variation and tolerance.	01 / 09	08
V	Quality management system & TQC: Quality policy, cost & quality, concept of TQM, management of reliability & quality, elements of quality systems, essential steps in implementing quality system for ISO: 9000.	03	10

Text / Referencebook:

1. Practical Reliability Engineering/ *Patrick D.T., O'Connor* / John Wiley & Sons 4th edition).
2. Reliability Engineering/ *E. Balagurusamy* / Tata McGraw- Hill.
3. Quality control & Total quality Management / *P.L.Jain* / Tata McGraw- Hill.
4. Reliability and Maintainability Engineering / Charles E. Ebeling / TMH

TEC 034 BIOMEDICAL SIGNAL PROCESSING

Unit-1	BOOK/CHAPTERS	LECTURES
1. Introduction to Bio-Medical Signals: Classification, Acquisition and Difficulties during Acquisition.	3/ 1&3	2
2. Basics of Electrocardiography, Electroencephalography, Electromyography & electro-retinography	1/ 2 , 3/ 3	4

3. Role of Computers in the Analysis, Processing, Monitoring & Control and image reconstruction in bio-medical field.	1/ 1 , 3/ 15	2
Unit-2		
4. ECG: Measurement of Amplitude and Time Intervals, QRS Detection(Different Methods), ST Segment Analysis, Removal of Baseline Wander And Power line Interferences, Arrhythmia Analysis, Portable Arrhythmia Monitors.	1/ 12&13 , 2/ 7	8
Unit-3		
5. Data Reduction: Turning Point algorithm, AZTEC Algorithm, Fan Algorithm, Huffman and Modified Huffman Coding, Run Length Coding.	1/ 10	8
Unit-4		
6. EEG:Neurological Signal Processing, EEG characteristic, linear prediction theory, Sleep EEG, Dynamics of Sleep/Wake transition. Study of pattern of brain waves, Epilepsy-Transition, detection and Estimation.	2/ 5	2
7. EEG Analysis By Spectral Estimation: The Bt Method, Periodogram, -Maximum Entropy Method & AR Method, Moving Average Method. The ARMA Methods, -Maximum Likelihood Method.	2/ 4	6
Unit-5		
8. EP Estimation: by Signal Averaging, Adaptive Filtering:- General Structures of Adaptive filters, LMS Adaptive Filter, Adaptive Noise Canceling, Wavelet Detection:- Introduction, Detection By Structural features, Matched Filtering, Adaptive Wavelet Detection, Detection of Overlapping Wavelets.	1/ 8&9 2/ 6&Appendix B	8

TEXT BOOKS

1. Biomedical Digital Signal Processing, Willis J Tomkin, Phi.
2. Biomedical Signal Processing, D.C Reddy McGrawhill
3. Biomedical Instrumentation and Measurement.,Crommwell,Weibel and Pfeifer, PHI

REFERENCE BOOKS:

4. Biomedical Signal Processing, Arnon Cohen, volume I & Licrc Press
5 Biomedical Signal Analysis A Case Study Approach, Rangaraj M. Rangayyan, John Wiley and Sons Inc.
6. Medical instrumentation Application and Design, john G. Webster, john Wiley & Sons Inc.

TEC – 041 RANDOM SIGNAL THEORY

Unit	Topic	Text Book/ Chapter	Lectures
1	Theory of probability Axioms of probability: set theory, probability space, conditional probability Repeated Trials: Combined experiments, Bernoulli trials, Bernoulli's Theorem.	01/ 01-03, 02/ 01	06
2 & 3	Concept of random variable: Introduction, distribution and density functions, specific random variables, conditional distributions. Functions of one random variable: function and distribution of random variable, mean and variance, moments, characteristic functions. Two random variables: Bivariate distributions, one function of two random variables, two functions of two random variables, joint moments, joint characteristic functions, conditional distributions Multiple random variables, sequences of random variables	01/ 04-08, 02 / 02-03	16
4 & 5	Concept of stochastic processes: Definition, systems with stochastic inputs, power spectrum, discrete-time processes. Random walks and other applications: random walks, Poisson poins and shot noise, cyclostationary processes, bandlimited processes and sampling theory, deterministic signals in noise. Spectral representation and estmation: factorization and innovations, finite-order systems and state variables, spectral representation of random processes, ergodicity, spectrum estimation Mean square estimation: prediction, filtering and prediction,	01/09-13	18

	Kalman filters. Entropy: Basic concepts, random variables and stochastic processes, MEM. Markov chain: introduction, higher transition probabilities and the Chapman-Kolmogorov equation, classification of states, stationary distributions and limiting probabilities, transient states and absorption probabilities, branching processes. Markov processes and Queueing theory: introduction, Markov processes, queueing theory.		

Text / Reference Books

1. Probability, Random Variables and Stochastic Processes/A. Papoulis & S. U. Pillai/4th ed./TMH
2. Probability, Random Variables & Random Signal Principles/Peyton Z. Peebles, Jr./TMH

TEC 042 VLSI DESIGN

Unit	Topic	Text Book	Lectures
1.	Introduction to integrated circuit technology. CMOS fabrication, the p-well process, n-well process, twin tub process. Bi-CMOS technology. Basic electrical properties of MOS circuits, I_{ds}-V_{ds} relationship, MOS transistor threshed voltage $V_{t,}$ Trans conductance and output conductance, MOS transistor figure of merit.	1	8
2.	The n-MOS inverter, pull-up to pull-down ratio, CMOS inverter and its characteristics, latch –up in CMOS circuits, stick diagrams, n-MOS design style, CMOS design style, lambda based design rules , Body effect, sheet resistance, capacitances of layers, Gate delays, Delay estimation, logical efforts, Scaling models and scaling factors, limitation of scaling, , Limits of miniaturization.	1	8
3.	n-MOS, CMOS NAND Gates, n-MOS, CMOS NOR gates. Combinational circuit design, sequential circuit design, design considerations, problems associated with VLSI Design, Design Methodology and Tools, Standard Cell Based Design, Design Flows, Automated Layout Generation, Placement, Floor planning, Routing, Parasitic Extraction, Timing Analyses.	1&2	8
4.	Full Custom Design, Semi Custom Design, Programmable Logic structures, Field Programmable Gate arrays (FPGA) , Configurable Logic Block (CLB), Application-Specific Integrated Circuits (ASICs)	2	8
5.	Design for Testability, Faults types and Models, Controllability and Observability, AD HOC Design Techniques, Scan-Based Techniques , Built-In self Test (BIST) Techniques, Current Monitoring I_{DDQ} Test. Packaging, Package Parasitics, Heat dissipation, Design Economics, Parametric yield.	2&3	8

Text Books:

1. Basic VLSI Design by Douglas A. Pucknell & Kamran Eshraghian, Prentice-Hall of India.
2. CMOS VLSI Design, A Circuits and Systems Perspective by Neil H.E. Weste, David Harris, Ayan Banerjee, Pearson Education.
3. CMOS Digital Integrated Circuits Analysis and Design by Sung-Mo Kang, Yusuf Leblebici. Tata Mc-Graw-Hill.

References:

1. Digital Integrated Circuits A Design Perspective by Jab M. Rabaey, Anantha Chandra kasan, Borivoje Nikolic, Prentice-Hall of India Pvt. Limited.
2. Principles of C-MOS VLSI Design A systems Perspective by Neil H.E. Weste, Kamrau Eshraghian, Pearson Education
3. Application-Specific Integrated Circuits by Michal John Sebastian smith, Pearson Education.

TEC043 Optical Networks

Unit No	Topic Name	Text Book	Chapter No	Lectures
1.	Introduction to Optical Networks	1	1	3
	Characteristics of Optical Fiber (Emphasis on Non Linear Characteristics)	1 2	2 3	2
	Timing & Synchronization	2	4	3
2.	Components			
	Couplers, Isolators & Circulators, Multiplexers & Filters, Optical Amplifiers	1	3	4
	Tunable Lasers	1	3	1
	Switches, Wavelength Converters	1	3	3
3.	Networks			
	SONET/SDH	1, 2	6, 5	3
	Multiplexing, SONET/ SDH Layers, Frame Structure, Frame Structure, Physical Layer, Elements of a SONET/SDH Infrastructure			
	ATM	1	6	2
	Functions of ATM, Adaptation Layers, Quality of Service, Flow Control, Signaling and Routing			
	WDM Network Elements	1	7	3
	Optical Line Terminals, Optical Line Amplifiers, Optical Add/ Drop Multiplexers, Optical Cross Connects			
4.	WDM Network Design	1	8	3
	Cost Trade-offs, Light path Topology Design, and Routing and wavelength assignment problems, Dimensioning Wavelength Routing Networks,			
	Network Survivability	1	10	3
	Basic Concepts, Protection in SONET/SDH, Protection in IP networks, Optical Layer Protection, Different Schemes, Interworking between Layers			
	Access Networks	1	11	2
	Network Architecture Overview, Enhanced HFC, FTTC,			
5.	Optical Switching	1	12	4
	OTDM, Synchronization, Header Processing, Buffering, Burst Switching.			
	Deployment Considerations	1	13	3

Text Books:

1. Ramaswami, Rajiv & Sivarajan, Kumar N. / “Optical Networks a Practical perspective”/ Morgan Kaufmann Publishers / 2nd Ed.
2. Black, Uyless / “Optical Networks Third Generation Transport Systems”/ Pearson Educations

Reference Books:

1. Tanenbaum. Andrew S./ "Computer Networks"/ Prentice Hall (India)
2. Murthy, C. Siva Ram & Gurusamy, Mohan / "WDM Optical Networks Concepts, Design & Algorithms" / Prentice Hall (India)

TEC 044 Digital Image Processing

Unit	Topic
1 &2	Introduction: Fundamental steps in DIP, elements of DIP, Simple image model, Sampling & quantization, basic relationships between Pixels, Color image model.
	Image Transforms: One-dimensional & Two-dimensional DFT, Cosine, Sine, Hadamard, Haar, and Slant & KL transforms.
	Image Enhancement: Introduction, Point operations, Histogram modeling, spatial operations, Transform operations.
3.	Image Restoration: Introduction, Image observation models, Inverse & Wiener filtering, difference between enhancement & restoration Restoration-spatial filtering, Noise reduction in frequency domain,
4.	Image Compression: Introduction, Pixel coding, Predictive coding, Transform coding, Interframe coding
5.	Image Segmentation: Introduction, Spatial feature extraction, Transforms features, Edge detection, Boundary extraction, Segmentation techniques.

Text Books:

1. Digital Image Processing, Rafael C. Conzalez Richard E Woods, 2nd Ed.
2. Fundamentals of Digital Image Processing, Anil K Jain.

U.P. TECHNICAL UNIVERSITY

LUCKNOW

Syllabus

of

4th Year (Sem. VII & Sem. VIII)

B. TECH.

(1) Electronics Engineering
(2) Electronics & Communication Engg.
(3) Electronics and Telecommunications Engg.