KAMLA NEHRU INSTITUTE OF TECHNOLOGY, SULTANPUR, INDIA

(An Autonomous govt engineering Institute under 2f & 12B of UGC act)

DEPARTMENT OF ELECTRONICS ENGINEERING,

K.N.I.T., SULTANPUR – 228118 (U.P.)

Revised Syllabus of 3 years (6 Semesters)

M.Tech. (full-Time) Electronics Engineering

Specialization in Communication Engineering

Electronics Engg. Department, K.N.I.T., Sultanpur

Study and Evaluation Scheme

M.TECH.(Full-Time)

Specialization Communication Engineering

SEMESTER-I

S. No	Course Code	Subject	Periods			Evaluation Scheme					Subject Total
						Sessional				Exami-nation	
		Theory	L	T	P	CT	Attend.	TA	Total	ESE	
1.	ELR-101	Information Theory & Coding	3	1	0	30	10	10	50	100	150
2.	ELR-102*	Digital Signal Processing	3	0	2	30	10	10	50	100	150
3.	ELR-103	Detection & Estimation Theory	3	1	0	30	10	10	50	100	150
4.	ELR-104*	Advanced Digital Communication	3	0	2	30	10	10	50	100	150
		Total-	12	2	4				200	400	600

*15 marks are for class test and 15 marks are for lab. If any, otherwise 30 marks are for class test.

SEMESTER-II

S. No	Course Code	Subject	Periods			Evaluation Scheme					Subject Total
						Sessional				Exami-nation	
		Theory	L	T	P	CT	Attend.	TA	Total	ESE	
1.	ELR-201	Mobile Communication	3	1	0	30*	10	10	50	100	150
2.	ELR-202	Optical Networks	3	0	2	30*	10	10	50	100	150
3.	ELR-203	Satellite Communication	3	1	0	30	10	10	50	100	150
4.	ELR-204	Microwave Component & Devices	3	0	2	30	10	10	50	100	150
		Total-	12	2	4				200	400	600

*15 marks are for class test and 15 marks are for lab. If any, otherwise 30 marks are for class test.

SEMESTER-III

S. No	Course Code	Subject	Periods			Evaluation Scheme					Subject Total
						Sessional				Exami-nation	
		Theory	**L**	**T**	**P**	**CT**	**Attend.**	**TA**	**Total**	**ESE**	
1.	ELR-301 ELR-302* ELR-303 ELR-304*	Elective I	3	1	0	30*	10	10	50	100	150
2.	ELR-305 ELR-306 ELR-307 ELR-308*	Elective II	3	1	0	30*	10	10	50	100	150
3.	ELR-309	Seminar	0	0	2	-	-	-	100	0	100
4.	ELR-310	Dissertation** To be Continued	0	0	8	-	-	-	-	-	-
		Total-	6	2	10				200	200	400

*15 marks are for class test and 15 marks are for lab. If any, otherwise 30 marks are for class test.

** 100 marks are for dissertation work will be evaluated during IV semester.

SEMESTER-IV

S. No	Course Code	Subject	Periods			Evaluation Scheme					Subject Total
						Sessional				Exami-nation	
		Theory	**L**	**T**	**P**	**CT**	**Attend.**	**TA**	**Total**	**ESE**	
1.	ELR-401	Dissertation	0	0	18	-	-	-	200**	200	400
		Total-	0	0	18				200	200	400

*100 marks are for ELR-310 work of Semester III and 100 marks are for ELR-401 work of Semester IV.

LIST OF ELECTIVES:

ELECTIVE -I

Course Code and Name of Subject
Theory Papers
1. ELR-301: VLSI Design 2. ELR-302*: Modelling and Stimulation of Communication System and etworks 3.ELR-303: Information Security 4. ELR-304*: Neural Network

ELECTIVE- II

Course Code and Name of Subject
Theory Papers
1. ELR-305 : Computer Network 2. ELR-306: Network Management 3. ELR-307: Mobile Computing 4. ELR-308* : Digital Image Processing

*15 marks are for class test and 15 marks for lab. If any any, or otherwise 30 marks for class test.

ELR-101 **Information Theory & coding** **L T P**

3 1 0

Introduction,Unit of information, Entropy, Rate of information, Joint entropy & conditional entropy, Mutual information channel capacity. Shannon's Theorm, Continious channel, Capacity of a Gaussion channel, Shannon - Hartley theorm,Bandwidth& S/N trade off,coding,Introduction,codingefficiency,Shannon-Fano coding Huffman coding, Error control coding.

Block codes: introduction, Single-Parity check codes, Product codes, Repetion codes, Hamming codes.

Linear codes: Definition of linear codes, Generator Matrices the standard array, Parity check matrices, Error syndromes, Error detection & correction, Shortend& extend; linear codes.

Cyclic Codes: Definition of cyclic codes, Polynomials, Generator polynomials, Encoding cyclic codes, Decoding cyclic codes, Factor of X^n+1, Parity check Polynomials, Dual cyclic codes, Generator& Parity check matrices of cyclic codes.

Convalutional codes: Convolution, Encoding convalutional codes, Generator Polynomials for Convolution codes, Graphical representation of convalutional codes, The Viterbi decoder.

Text Books:

(1) Introduction to Error control codes
By- Gravano
(2) Communication System
By- R.P. Singh
S.D. Sapre

Reference Book.

1. T.M. Cover Elements of information Theory-2006(2^{nd} addition)

1. R.E. Blahut, Digital Transmission of information addition-Weslery-1990

ELR-102 Digital signal processing L T P

3 0 2

Unit 1 :Multirate Signal Processing

Introduction, decimation, interpolation, sampling rate conersion, implementation of samplin rate conversion (src) , src of bandpass signal , src by an arbitrary factor , Applications of src.

Unit 2: Linear Prediction and optimum linear factor

Random signals , correlation function , power spectra , sationary random process , forward and backward prediction , solution to normal equation , wiener filter.

Unit 3: Adaptive signal processing

Application of adaptive filters,LMS algorithm, RLS algorithm , ladder filters

Unit 4 :Power spectrum estimation

Estimation of spectra from finite duration , observation of signals , parametric and nonparametricmethods,power spectrum estimation,filter bank method,algorithms forspectrumestimation .

Unit 5 :Two dimensional and homomorphic signal processing

Two dimensionalsignal and systems , causality , separability , stability
frequency domain technique convolution , DFT and filter design consideration .
Introduction to homomorphic signal processing , generalized super position theorem .

Text Books

1. Digital Signal Processing , Principal Algorithm and Application --- Proakis and Manolakis

2. Theory and applications , digital signal processing ---- Rabiner and Gold

3. Digital Signal Processing ----- Oppenheim and Schafer

ELR-103 Detection & Estimation Theory L T P

3 1 0

Unit 1: Signal Presentation

Stochastic signals, orthogonal Representation of signal, Random process, Markov process.

Autocorrelation function & its properties, Cross correlation function.

Unit 2 : Detections

Power spectral Density, Detection in presence of Noise, Correlator, optimum filter, Matched filter

Unit 3 :Testings

Ambiguity function and its properties, Weighted probabilities and hypothesis testing,

Composite hypothesis, likelihood ratio detection, Sequential testings.

Unit 4 : Estimation

Principle and properties of estimator, Cramer Rao Bound, Baye's maximum likehood

Estimation, Least Square Estimation, Parameter Estimations.

Unit 5 : Application of Detection and Estimation theory

Estimation of stationary and continuous targets, time invariant linear estimation.Swearling

Models Estimation.

References :

1. Principles of Digital Communication – Das, Mallick and Chatterjee.
2. Radar Signal Processing – Richards A. Mark.
3. Introduction to Radar Engineering – M. Scolnik.
4. Communication Systems – Simon Haykens.

ELR-104 Advanced Digital Communication L T P

3 0 2

Overview of Digital Communication: Digital Communication system model, communcation channels characteristics and models, signalspace**reprensentation**, Huffman and Shannon Fanocodind techniques.

Digital Communication Techniques: Digital Modulation Format, Coherent Binary Modulation Techinques, Coherent Quadrature Modulation Techniques, Non Coherent Binary Modulation Techniques, Comprasion of Binary and Quartenary Modulation Techniques, M-Ary Modulation techiques.

Modulation and Demodulation Additive Gaussian Noise Channel: Representation of Signal waveforms and channel characteristics ,Binary and M-Ary orthogonal signaling in an AWGN channel, M-Ary signaling with equicorrelated, M-Arybiothogonal signaling and multiphase signaling waveforms, M-Ary PAM signaling waveforms,combined multiple phase and multiple amplitude waveforms, comparison of digital signaling methods.

Digital Signaling with ISI and Additive Gaussian Noise: Characterization of band limited channels, design of band limited signals for no inter Symbol interfernce-The Nyquistcriteria,design of band limited signals with controlled inter symbol interference(partial-response signals), optimum demodulation for inter symbol interference and additive Gaussian noise.

Spread Spectrum Modulation: Pseudonoise sequences, a notion of spread spectrum, direct sequence spread coherent binary phase shift keying, signal-space dimensionality and processing gain, probability of error, frequency hope spread spectrum.

Books:

1. Simon Haykin, Digital Communication John Wiley and sons.

2. John G. Proakis, Digital Communication, 4th edtion McGraw-Hill.

3. B.P. Lathi, Modern Digital and Analog Communication Systems, 3rd edition, Oxford university press.

4. J. Das, S.K. Mullick and P.K. Chatterjee, Principles of Digital Communications, New Age International (P) Ltd. Publisher, New Delhi.

ELR-201 **Mobile Communication** **L T P**

3 1 0

Unit 1:

Prediction of propagation loss and fades- Prediction over flat terrain, point to point prediction, microcell prediction model. Amplitude fades random PM and random FM, selective fading, diversity schemes, combining techniques, bit error-rate and word error-rate.

Unit 2:

Mobile Radio interference and frequency plans- Co-channel and adjacent channel interference, intermodulation, intersymbol and simulcast interference channelized schemes and frequency reuse FDM, TDM, spread spectrum and frequency hopping cellular concept and spectral efficiency.

Unit 3:

Design parameters at base station and mobile used- Antenna configuration noise, power and field strength, directional antenna and diversity schemes frequency dependency, noise, antenna connection, field component diversity antennas.

Unit 4:

Signalling and channel access- Word error-rate, channel assignment.

Microcell system- Conventional cellular system microcell system design capacity analysis.

Unit 5:

Grade of service and introduction to mobile devices, hardware and OS, mobility support.

Text and References

1) Mobile Communication Design Fundamentals.
   -by W C Y Lee; Wiley.

2) Mobile Data Communication System.

   -by P. Wong and D. Britland; Artech House.

3) Wireless Communications.

   -by T. S. Rappaport; Prentice Hall.

4) Wireless Communication. –by Andrea Goldsmith

ELR-202 **OPTICAL NETWORKS** **L T P**

3 0 2

UNIT-I

INTRODUCTION:-Telecommunication Networks Architecture , Optical networks Multiplexing , 2nd generation optical networks, The optical Layer , Optical packet switching , Transmission Basics.
PROPAGATION OF SIGNALS ;- Light propagation in optical fiber. Loss and Bandwidth

UNIT –II

COMPONENTS - Couples Isolators and circulators , LED, Tunable lasers , optical Amplifiers.
MODULATION- Subcarrier Modulation and Multiplexing , Spectral Efficiency , Demodulation , An ideal receiver bit error rates coherent detection.

UNIT- III

DESIGN- Design of soliton systems , design consideration SONET /SDH – Multiplexing ,.
SONET / SDH layers ,SONET frame structure ,Physical layers , Elements of a SONET/ SDH Infrastructure , ATM.

UNIT- IV

WDM NETWORK ELEMENT- Optical line terminals , Optical line Amplifiers , Optical add/ Drop Multiplexers.
WDM NETWORK DESIGN- Cost Trade offs, light path topology design , Routing and wavelength Assignment , Dimensioning Wavelength Routing Network.
PERFORMANCE OF WDH +EDFA SYSTEM - link Bandwidth optical power requirement for a specific BER , Crosstalk.

UNIT-V

Access Network - Network architecture overview , Enhanced HFC , FTTC (fiber to the curb) PON Evaluation.
Optical CDMA
Ultrahigh capacity networks- Ultrahigh capacity WDM systems Bit interleaved optical TDM, Time slotted optical TDM.

Text and References:-

1- Optical Networks:- a) Rajiv Ramaswami

b) Kumar N. Sivrajan

2- Optical Communication:- a) Gerd Keiser

ELR-203	Satellite Communication	L T P
		3 1 0

Unit-I

Element of Satellite communication,Orbit determination,Launches & Launch vechicles,orbital effects in communication system performance, Geostationary orbit.

Unit-II

Satellite sub systems, attitude & orbit control system,Telementry,Tracking & Command (TT&C),Communication subsystems,satellite antennas.

Unit-III

Satellite link design: basic Transmission theory,system noise temperature & G?T ratio, downlink design,uplink design, satellite system using small earth station, design for specified C/N.

UNIT-IV

Multiple Access: Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA), DS-CDMA & Frequency hopped CDMA.

UNIT-V

Satellite Applications : Satellite mobile Service, VSAT, low earth orbit & non Geostationary,direct broadcast satellite television & radio, satellite navigation & the Global Positioning Systems.

Text Books:

1. B.Pratt, A.Bostian, “Satellite Communication”, Jhon Wielly & sons.
2. Dennis reddy, “Satellite Communication”, McGraw-Hill
3. K.N. Raja Rao, “Satellite Communication” PHI

ELR-204 Microwave Component & Devices L T P

3 0 2

Unit I: Introduction to Microwaves

Review of Maxwell's Equations, Wave Equation, Microwave Frequencies, Rectangular Wave Guides: Field Components, TE, TM Modes, Power Transmission & Loss, Circular Waveguides: TE, TM modes, Microwave Cavities.

Unit II: Microwave Components

Microwave Hybrid Circuits: Waveguide Corners, Bends and Twists, Attenuators, Phase Shifters, Directional Couplers: Two Hole directional couplers, Hybrid Couplers, Microwave Propagation in ferrites, Faraday rotation, Isolators, Circulators, S- parameter analysis of all components.

Unit II: Microwave Tubes

Limitation of Conventional Active Devices at Microwave frequency, Two Cavity Klystron, Reflex Klystron, Magnetron, Traveling Wave Tube and Backward Wave Oscillators: Their Schematic diagrams, Principle of operation, Performance Characteristic and their applications.

Unit IV: Solid State Amplifiers and Oscillators

Microwave Bipolar Transistor, Microwave Field-effect Transistor, Microwave Tunnel diode, Transferred electron devices: Gunn diode, Avalanche Transit-time devices: IMPATT Diode, TRAPPAT Diode, PIN diode.

Unit V: MIC Design and Manufacturing

Introduction, Materials: substrate, conductor, dielectric, resistive, Types of MICs and their technology, Monolithic Technology, Hybrid Technology, MIC Lumped and Distributed Elements.

Books:

1. Samuel Y. Liao, "Microwave Devices and Circuits", Third Edition, Pearson Education.
2. A. Das and S. K. Das, "Microwave Engineering", Second Edition, TMH.
3. R.E Collin, "Foundation for Microwave Engineering", Second Edition, John Wiley India.
4. David M. Pozar, "Microwave Engineering", John Wiley & sons.
5. K.C. Gupta & A. Singh: Microwave Integrated Circuits, Eastern Wiley.

K.D. Prasad and M. Prasad, "Introduction to Anteena and Wave Propagation", Satya Prakashan.

ELR-301 VLSI Design L T P

3 1 0

Unit 1: A review of Microelectronics and An Introduction to MOS Technology

Introduction to Integrated Circuit technology, The Integrated Circuit (IC) Era, Metal-Oxide-Semiconductor (MOS) and Related VLSI Technology, Basic MOS Transistors, Enhancement Mode Transistor Action, Depletion Mode Transistor Action, nMOS Fabrication, CMOS Fabrication, BiCMOS Technology.

Unit 2 : Basic Electrical Properties of MOS and BiCMOS Circuits

Drain – to – Source Currents I_{ds} versus Voltage V_{ds} relationships, Aspects of MOS Transistor Threshold Voltage V_t, MOS Transistor Transconductanceg_m and Output Conductancesg_{ds}, MOS Transistor figure of Merit ω_0, The Pass Transistor, The nMOS Inverter, determination of Pull-up to Pull-down Ratio ($Z_{z.u.}/Z_{p.u.}$) for an nMOS Inverter Driven b y another nMOS Inverter, Pull-up to Pull-down Ratio for an nMOS Inverter Driven through one or more Pass Transistors, Alternatives forms of Pull-up,the CMOS Inverter, latch-up in CMOS Circuits..

Unit 3 : MOS and BiCMOS Circuit Design Process

MOS Layers, Stick Diagrams, Design Rules and Layout, General Observations on the Design Rules.

Unit 4: Scaling of MOS Circuits

Scaling Models and Scaling Factors, Scaling Factors for Device Parameters, Some Discussion on the limitations of Scaling, Limits due to Subthreshold Currents, Limits on the Logic Levels and Supply Voltage due to Noise, Limits due to Currents density.

Unit 5 :Ultra-fast VLSI Circuits and Systems – Introduction to GaAs technology

Ultra-Fast Systems, Gallium Arsenide Crystal Structure, Technology Development, device Modelling and performance Estimation, MESFET- Based design.

References :

Textbooks :

1. D.A.Pucknell and K.Eshraghian, “Basic VLSI Design : Systems and Circuits”, PHI, 3rd Ed.,1994

Reference Books :

1. S.M.Sze “VLSI Technology”, 2nd edition, McGraw-Hill Publication.
2. S.K.Gandhi, “VLSI Fabrication Principles”, 2nd Edition, Willy-India Pvt. Ltd.
3. J.D.Plummer, M.D.Deal and Peter B. Griffin, “Silicon VLSI Technology : Fundamentals, practice and modelling”, Pearson Education.
4. Stephen A. Campbell, “Fabrication Engineering at the micro and nano scale”, oxford univ., Press..

ELR-304 NEUTRAL NETWORKS L T P

3 1 0

1. **Introduction**
   introduction and history, human brain, biological neurons, models of neuron, signal flow graph of neuron, feedback, network architecture, knowledge representation, Artificial intelligence and neural networks.
   Learning process
   Error correcting learning, memory based learning, Hebbian learning, competitive learning, Boltzmann learning, learning with and without teacher, learning tasks, adaptation.
2. **Artificial neurons, Neural networks and architectures**
   Introduction, neuron signal function, mathematical preliminaries, feedforward& feedback architecture.
   Geometry of Binary thresholds 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.
3. **Perceptions and LMS**
   Learning objective of TLN, pattern space and weight space, perceptron learning algorithm, perceptron convergence theorem, pocket algorithm, α-LMS learning, MSE error surface, steepest descent search, μ-LMS and application.
   Backpropagation and other learning algorithms
   Multilayered architecture, backpropagation learning architecture, learning algorithm, practical consideration, structure growing algorithms, applications of FFNN, reinforcement learning.
4. **Statistical pattern Recognition**
   Bay's theorem, classical decisions with bay's theorem, probabilistic interpretation of neuron function, interpreting neuron signals as probabilities.
   RBF Networks
   Regularization networks, generalised RBF networks, RBF network for solving XOR problems, comparison of RBF networks and multi-layered perceptions.
5. **Stochastic Machines**
   Statistical machines, simulated annealing, Boltzmann machine, Fuzzy sets, Fuzzy systems and applications, neural networks and fuzzy logic.

Text book /References

1. Simon Haykin, "Neural Networks", pearson education 2nd edition
2. SatishKumar,"NeuralNetworks",TataMcGraw-hill
3. Jack M Zurada "introduction to Artificial neural System", Jaico Publishing House.
4. Timothy J.Ross , "fuzzy Logic with Engineering Applications",McGraw-Hill Inc.

ELR-308 **Digital Image Processing** **L T P**

3 1 0

1. Introduction

Steps in Digital Image Processing,Components of an Image Processing System, Applications. Human Eye and Image Formation; Sampling and Quantization, Basic Relantionship among pixels-neighbor,connectivity, regions, boundaries, distance measures.

2. Image Enhancement

Spatial domain-gray level transformatios, Histogram, Arithmaetic/Logical Operations, Spatial filtering, Smoothing & Sharpening Spatial filters;Frequency Domain- 2-D Fourier transform, Smoothing and Sharpening Frequency Domain Filtering; Convolution and Correlaion Theorems.

3. Image Restoration

Inverse filtering, Wiener Filtering; Wvelets-Discrete and Continuous wavelet Transform,Wavelet Transform in 2-D.

4. Image Compression

Redundancies-Coding ,Interpixel,Psycho Visual: Fidelity, Source and Channel Encoding,Elements of Information Theory;Loss Less and Lossy Compression; Run length coding, Differential encoding, DCT, Vector quantization, entropy coding, LZW coding; Image Compression Standards-JPEG,JPEG 2000,MPEG; video compression;

5. Pattern recognition

Introduction to pattern recognition, pattern recognition methods,pattern Recognition System Design. Statistical Pattern recognition –classificaton, principle,classifierlearning,neural networks for pattern classification.

Textbooks/Refernces

1. Fundamentals of Digital Image processing- A.K Jain, Pearson Education.
2. Digital Image Processing –R.C. Gonzalez and R.E. Woods, Pearson Education.
3. Digital Image Processing using MATLAB- R.C. Gonzalez, R.E. Woods and S.L Eddins, Pearson Education.
4. Digital image Processing and Analysis- Chanda and Mazumdar,PHI.

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Revised Syllabus of 3 years (6 Semesters)

M.Tech. (Part-Time) Electronics Engineering

Specialization in Digital electronics & systems

LIST OF ELECTIVES

Elective-I

EL-508 Advanced VLSI Network

EL-509 Fuzzy Logic & Control

EL-510 Neutral Networks

EL-511 Communication Networking

Elective-II

EL-512 Bio-Instrumentation

EL-513 Opto-Communication

EL-514 Satellite Communication

EL-515 Information & Coding Theory

Electronics Engg. Department

K.N.I.T., Sultanpur

M.TECH.(Part-Time)Electronics Engg. With Specialization in Digital Electronics & System.

SEMESTER-I

S. No	Course Code	Subject	Periods		Evaluation Scheme					Subject Total
					Sessional				Exami-nation	
		Theory	**L**	**Tut./Prac.**	**CT**	**Attend.**	**TA**	**Total**	**ESE**	
1.	EL-500	Digital Systems	3	1	30	10	10	50	100	150
2.	EL-501	Linear Dynamical Systems	3	1	30	10	10	50	100	150
3.	EL-502*	Analog Signal Processing	3	2	30*	10	10	50	100	150
		Total-	9	4				150	300	450

*15 marks are for class test and 15 marks are for lab. If any, otherwise 30 marks are for class test.

SEMESTER-II

S. No	Course Code	Subject	Periods		Evaluation Scheme					Subject Total
					Sessional				Exami-nation	
		Theory	**L**	**Tut./Prac.**	**CT**	**Attend.**	**TA**	**Total**	**ESE**	
1.	EL-503	LSI/VLSI Devices & Circuits	3	1	30	10	10	50	100	150
2.	EL-504	Computer Simulation of Electronic Circuits	3	1	30	10	10	50	100	150
3.	EL-505*	Digital Control	3	2	30*	10	10	50	100	150
		Total-	9	4				150	300	450

*15 marks are for class test and 15 marks are for lab. If any, otherwise 30 marks are for class test.

SEMESTER-III

S. No	Course Code	Subject	Periods		Evaluation Scheme					Subject Total
					Sessional				Exami-nation	
		Theory	**L**	**Tut./Prac.**	**CT**	**Attend.**	**TA**	**Total**	**ESE**	
1.	EL-506	Advanced Digital Signal Processing	4	2	30	10	10	50	100	150
2.	EL-507	Organization of Computer Systems	4	2	30	10	10	50	100	150
		Total-	8	4				100	100	300

SEMESTER-IV

S. No.	Course Code	Subject	Periods		Evaluation Scheme					Subject Total
					Sessional				Exami-nation	
		Theory	L	Tut./Prac.	CT	Attend.	TA	Total	ESE	
1.	EL-508 to EL-511	Elective-I	4	2	30	10	10	50	100	150
2.	EL-512 to EL-515	Elective-II	4	2	30	10	10	50	100	150
		Total-	8	4				100	200	300

SEMESTER-V

S. No.	Course Code	Subject	Periods		Evaluation Scheme					Subject Total
					Sessional				Exami-nation	
		Theory	L	Tut./Prac.	CT	Attend.	TA	Total	ESE	
1.	-	Seminar	-	2	-	-	-	100	-	100
2.	DP1	Dessertation	-	10	-	-	-	100	-	100
		Total-	-	12	-	-	-	200	-	200

SEMESTER-VI

S. No.	Course Code	Subject	Periods		Evaluation Scheme					Subject Total
					Sessional				Exami-nation	
		Theory	L	Tut./Prac.	CT	Attend.	TA	Total	ESE	
1.	DP2	Dessertation	-	12	-	-	-	100	200	300
		Total-								

EL-500 DIGITAL SYSTEMS L T P

3 1 0

Review of logical organization of computers Binary Systems and Karnaugh Maps, Simplification of binary expressions using Quine-Mclausky Methods, Combinatorial switching circuits, integrated NAND-NOR gates, open collector & tri-state logic, Realizations of different functions using NAND –NOR gates.

Sequential switching circuits , flip flops, counters, state transition diagram, shift registers used sequential circuits, realizations using word statement, designing with MSL

IEEE logic conventions , design of different digital functional units(registers and counters) clocking and control , semiconductor memories.

Description of digital systems, Adders , multipliers, Floating point adders, Analog to Digital conversion, Microprocessor architecture.

Multipliers, decoders, and demultiplexer, Code convertors , Binary to Residue convertor, Error detecting and correcting codes, digital control of processes.

References:

1. Digital computer design, V Raja Raman &Radhakrishnan , PHI
2. Integrated Circuits in Digital Electronics, Barn &Poral, wleyInterscince
3. Microelectronics , Millman&Grabel, Me-Graw Hill
4. Digital principles and application, Malvino& Leach , McGraw Hill
5. Microelectronics , AS Sedra and KC Smith, Holt Sannders
6. Digital Logic and computer Design , m morris Mano, PHI

EL-501 **Linear Dynamical System** **L T P**

3 1 0

Concept of state, system representation in state-variable form, SISO & MIMO.

Controllability and Observability Phase variable, canonical, Jordan canonical and Physical forms, representation of Nonlinear systems and Linearization of system equations.

State function of Lagrange, system Response and STM,Resolving Matrix , Sylvester Expansion Theorem , solution of state equations.

Stability and the state function of Liapunov,Quadratic forms , stability in the sense of Liapunov, Second method of Liapunov, V-functions, asymptotic and global stability and instability, stability linear systems, estimation of transient behaviour , application to non-linear systems.

Introduction to optimal control and state function of Pontryagin, basic concept of calculus variations and state function of Pontryagin.

Introduction to discrete time system, Difference equations and their solutions by recurse method, state variable representation of discrete time systems.

References :

1. Donald G.Schultz and James L.Melsa, State function and linear control systems, McGraw Hill 1967 (Chapters 1 to 5 and sections 6.1, 6.2 and 6.3).

2. K. Ogata , State space analysis of control systems, prentice hall 1967.

3. K. Ogata , Modern control theory.

EL-502 Analog Signal Processing L T P

3 2 0

Approximation of Butterworth,Chebyshev, Inverse Chebyshev,Bessel, elliptic and flat filter functions.

Current feedback amplifier (CFA : AD-844), current conveyors, FTFN, FDNR, GIC and realisation, Generalised active realisation,Immittance and inductor simulation circuits using applications.

Sallen& key LP, HB,BP and universal Filter realisation using Op-amps, Programmable biquad using CFAs,State variable & Switched Capacitor filters.

Sensitivity Considerations: Relative Sensitivity, Pole position and coefficient sensitivity, spread considerations.

Introduction to digitally Programmable active RC Networks (Integrators/differentiator VCO) using CFAs suitable for Analog Signal Processing.

References :

1. L.P. Huelsman& P.E. Allen, Introduction to the Theory and Design of Active McGraw Hill 1980.

2. C. Toumazou, F.J. Lidgey& D.G. Haigh,Analog IC design:The current – mode Peter Peregrinus Ltd '1990.

3. C. Tourazou and J. Lidgey, Current – feedback Op-amps:A blessing in disguised Magazine on Circuits and Devices. Vol 34-37, Jan.1994.

4. G.C. Themes &S.K.Mitra,Moldern filter Theory and Design John Wiley,1973 .

5. L.J. Geis Transform Analysis and Filters, Englewood Cliffs, NNJ : Prentice –Hall,1989 .

6. S .Natrajan,Theory and Design of Linear Active Networks,Macmillan Pub.Co 1987.

7. Ghausi and Laker, Active and Switched capacitor filters , John Wiley.

EL-503 LSI/VLSI DEVICES AND CIRCUITS L T P

3 1 0

Fabrication Principles: Lithography, Diffusion, Ion implantation, Electron beam technology.

Introduction to LSI/VLSI Systems
LSI/VLSI Devices: NMOS, CMOS, TTL, ECL, STTL. Devices modeling, effects of scaling down, performance limitations.

Basic circuits & cells of LSI/VLSI systems: Gates, Flip-flops, shift registers, counters, adders etc.

Memory circuits: Static and Dynamic RAM, ROM applications.

System Design of LSI/VLSI: Various design approaches-Random logic, PDA, standard cell. Some example like single chip, Watch, Calculator & Microprocessor. Computer Aids in Design, Simulation and Layout of ICs.

References:

1. S.K. Gandhi, Theory and practices in microelectronics, John Wiley.
2. B.W. Streetman, Solid state electronic devices, PHI.
3. S.M. Sze, VLSI Technology, McGraw Hill.
4. D.W. Lewis, Theory & design of Digital computers.
5. Samuel C. Lee. Digital Circuits & Logic Design, PHI.

EL-504 COMPUTER SIMULATION OF ELECTRONIC CIRCUITS L T P

3 1 0

DC Analysis of Linear Network: Solution of Simultaneous, spares, Linear equations: DC analysis of nonlinear circuits, transients analysis of linear and non-linear circuits, hybrid analysis.

Circuits models for common semiconductor devices: Micromodels for analog ICs, Implementation of general purpose circuit analysis program like SPICE/PSPICE.

Logic simulation at Gate level, kinds of input description languages, data structure for event driven simulation, delay and scheduling of process, hazards, races and oscillations. Introduction to fault simulation.

Timing simulation, limitations, waveform relaxation. Optimization techniques and sensitivity analysis.

References:

1. Computer simulation of electronic circuits. R. Radharam-Wiley Eastern Ltd.
2. Computer Aided Network design by Donald A. Calahan-Tata. Mc. Graw Hill.

EL-505 **DIGITAL CONTROL** **L T P**

3 2 0

Sample & Hold Operation:- Mathematical model, ZOH, sampled spectra and aliasing. Transform analysis of discrete data systems: Pulse response, Z-transform- Region of Convergence and properties, discrete transfer function, Function sampling as impulse modulation, systems with sampler and ZOH.

Z-domain representation of digital control system. Jury stability Tests. Transform design of digital controls-classical design using root locus and frequency response techniques.

State space Analysis: Discrete time equations, Similarity transformations, canonical realization. Realization of Pulse Transfer functions, Controllability & observability, Lyapunov Stability Analysis and stability theorems.

Design of Digital Controls and state estimation: Formulation of optimal control problem, optimal state regulator. State observes. Stochastic processes and stochastic optimal state estimation, Kalman filter.

Identification problem, parameter estimation, least squares algorithms, maximum likelihood. Minimum variance prediction and control. Self-tuning regulators.

References:

1. M. Gopal, Digital control Engineering, Wiley Eastern Ltd.(Chapter 1 to 6).
2. B.C. Kuo, Analysis & Prentice-Hall 1963.
3. B.C. Kuo, Digital control systems.
4. Frank L. Lewis, Optimal Estimation with an Introduction to stochastic control Theory, Wiley 1986.

EL-506 ADVANCED DIGITAL SIGNAL PROCESSING L T P

4 2 0

Review of Discrete-Time signals, systems and Z transform. Two dimensional signal, difference equation representation and Z transform.

Discrete fourier Transforms, FFT algorithms- DIT and DIF and algorithm for N composite numbers, Chirp Z-Transform algorithm. Discrete Hilbert Transform IIR and FIR digital filter and state flow graph representation. Tellegen's theorem for digital filters.

Digital filter design Techniques for IIR and FIR filters. Effect of finite register lengths in Homomorphic signal processing. Applications in speech processing and power spectrum estimation. Introduction to Multirate Digital Signal Processing.

References:

1. A.V. Oppenheim and R.W. Schafer, Digital Signal Processing, PHI, 1988.
2. L.R. Raabiner & B-Gold, Theory and Application of Digital Signal Processing, PHI.
3. M. Bellanger, Digital Processing of Signals Theory and Practice, Wiley, 1984.
4. D.J. De Fatta, J.G. Lucas and W.S. Hodgki, Digital Signal Processing. A Systematic Approach, John Wiley, 1987.

EL-507 ORGANISATION OF COMPUTER SYSTEMS L T P

4 2 0

Computer Organization, Microcomputer organization and operation. Digital hardware formultiplication , division and addition , organization of control unit , ALU and I/O devices. Instruction incoding and various aspects of machine language.Assembly language and assemblers.

8085 microprocessor architecture and programming.Interfacing and Peripherals.Comparision with other 8-bit microprocessors.

Basicarchitecture and organization of a typical 16-bit (Intel 8086) microprocessor and programming.A brief overview of other 16-bit, 32-bit and 64-bit processors, Control Algorithms using Microprocessors. Description of Micro controllers, Digital quantization, Microprocessor based Control system – position control system, temperature control system, process model.

References:

1. C.W. , Computer Organisation& Programming, McGraw Hill ISE 1981.
2. J.P. Hayes, Computer architecture & Organization, PHI.
3. R.L. Tokheim, theory & Problems of Microprocessor fundamentals, Schaum's outline series.
4. M. Gopal, Digital control engineering, Wiley Eastern Ltd., 1988 (Chapter 7 & 8).

EL-508	Advanced VLSI Networks (Elective-1)	L T P 4 2 0

BiCMOS Logic Circuits: Introduction, BiCMOS Circuits, Static Behaviour, Switch delay and applications, Submicron CMOS Technology, GaAs VLSI Technology, Gallium Arsenide Crystal structure, Technology Development GaAs devices, Metal semiconductor FET (MESFET).

Device modelling and performance estimation: Device characterization, Drain to Source Output derivation, Transconductance and output conductance, Logic Voltage swing, Direct Coupled (DCFL) inverter, Chip input and output (I/O) Networks ESD Protection, Input circuits, Output Circuits and L(di/dt) Noise, On-Chip clock generation and distribution.

References:

1. Sung- Mo Kang and Yusuf Leblebici, CMOS Digital Integrated Circuits, (IIIrd Edition), 2003.
2. D. A Pucknell and K Eshraghian Basic VLSI Design, (IIIrd Edition), PHI, 2000.
3. Alvarez, A. R., BiCMOS Technology and Applications, (IInd Edition), Kluwer Academic Publishers.
4. S. M. Sze, VLSI Technology, McGraw Hill, NY, 1983.

EL-509	Fuzzy Logic & Control	L T P
	(Elective 1)	4 2 0

Basic Notion and concepts of Fuzzy Sets : Set membership. Types of membership function characteristics of a Fuzzy sets, Fuzzy sets Operations, Fuzzy relations and their calculus, Fuzzy Number Linguistic variables, Predicate logic and Fuzzy Logic, Fuzzy rule based expert systems, Fuzzy Tuning of PID Controller and Digital Filter, Fuzzy Control of Robotic Manipulator, Tuning of Fuzzy Logic controllers by Parameter Estimation Method Fuzzy Logic Software and Hardware and applications.

References:

1. Mohammad Jamshidi, Nader Vadiee& T J Ross. Fuzzy Logic and Control Software Hardware applications: Prentice Hall, Englewood Cliffs, N J.
2. WitoldPedryez and Fernando Gomide. An Introduction to Fuzzy sets Analysis and Design PD 2004.
3. Klir, G. J. and Folger, T A, Fuzzy sets, uncertainly and Information, Englewwood cliffs, N J. Prentice Hall, 1988.
4. Kosko B, Neural Networks and Fuzzy Systems, ADynammical Systems, Approach to Machme Intelligence, Englewood Cliffs, NJ, Prentice Hall.
5. Dubious, D, and H Prade, Fuzzy sets and Systems Theory and applications, Academic pres NY, 1980.

EL-510	Neural Networks	L T P
	(Elective I)	4 2 0

Scope and description, Bayesian Approach for pattern classification, Wiener-Hopf equation, LMS algorithm, conversion consideration of LMS algorithm.

Neuron and Synapses, Physiological evident of storage of information, McCulloch-pitts model for logical function and parity perception, continuous time model, learning models, Hopfield net and convergence of output states, content addressable memory (CAM), hamming net, carpenter classifier, single layer perception, Maximum likelihood Gaussian classifier, Multilayer perception error-back propagation.

Radial-basis function networks, self-organizing feature map, K means algorithm, Boltzmann Machine, Fuzzy concepts and fuzzy neural net, adaptive resonance theory, Hebbian learning, Competitive learning, neural networks for speech recognition, vector quantization, channel equalization classification.

References-

1. Simon Haykin, Neural Networks, Macmillan college publishing Company, NY.

2. Y.H.Pao, Adaptive pattern recognition and neural networks- Addison Wesley and Company Inc.

3. R.P.Lippman, "An introduction to computing with neural nets". IEEE ASSP April 1937 pp 4-22.

EL-511 Communication Networking L T P

4 2 0

ISO reference model, and hierarchies in data network architecture, basics of queuing theory M/M/I, M/G/I and M/M/N queues, delay analysis. Erlang delay and erlang blocking, Simple error correction/error detection schemes in data network. The data link layer, ALOHA with variations DAMA, SCPC, Simple network topologies. Ring network: SDLC loop: token passing. The network layer: DECNET: Integrated Service Digital Networks.

References:

1. Data Networks by Beerdsekas and Gallager.

2. Computer Networks by Tannenbaum, AS, PhI.

3. Local Area Network by Geek, KCF.

EL-512	Bio-Instrumentation	L T P
	(Elective-II)	4 2 0

Fundamentals of Medical Instrumentation: Sources of Biomedical signals, basic instrumentation system, performance requirements of Medical Instrumentation systems, Medical instrumentation systems, General consideration in design of medical instrumentation system, Biofeedback instrumentation.

Biomedical Recorders: Electrocardiograph, vector cardiograph, phone cardiograph,Electroencephalograph,Electromyograph.

Blood Flow meters: Types of Electromagnetic Flowmeters,ultrasonic blood Flowmeters and laser blood Flowmeters.

Thermal Imaging Systems: Medical thermography,Infrared Detectors,Pyroelectric camera.

Laser applications in bio medical field: The laser, Pulsed Ruby, He-Ne and semiconductor and laser safety,High Frequency ventilators.

References:

1. Les Lie Cromwell,F.J.Weibell and E.A.Pleiffer, Biomedical Instrumentation Measurements, (IInd Edition),PIII

2. R.S.Khandpur,Handbook of Biomedical Instrumentation, IInd Edition, Tata McGraw.

3. William F. Garong, Review of Medical Physiology,McGraw Hill.

4. H.M.Yasuf, Biomedical Electronics (IindEdition), Philadelphia, F.A.Davis CO.

EL-513	Opto- Communication	L T P
	(Elective II)	4 2 0

Optical devices LED, Semiconductor and Solid State Lasers, Modulation of lasersources. Avalanche and PIN photo detectors and their noise characteristics. Solar cells- types of Structures, Spectral Response and Efficiency.Optical fibres and their characteristics, di-electric film optical guides and couplers.

Opto Electronic Communication System: Optical receivers, digital receivers performance. Point to Point digital link, Noise Effects on System Performance. Overview of analog links.Multichannel transmission techniques.

Coherent Optical Fibre Communication: Modulation Techniques, direct detection, PSK Homodyne system, Heterodyne detection.

References:

1. John Gowar, Optical communication system, PHI.

2. Gerd Keiser, Optical fibre communication, McGraw Hill, ISE.

3. John M. Senior, Optical Fiber Communications.