NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION

SEMESTER: VI

S. No	BoS	Sub Code	Subject Name	Periods/week			Examination Scheme					Total Marks	Credits L+(T+P)/ 2
				L	T	P	TA	F E	S E	T.C. A.	ES E		
1	ETC	ET2063X	Elective-2	3	1	-	20	15	15	50	70	120	4
2	ETC	ET20611	Data communication and networking	3	1	-	20	15	15	50	70	120	4
3	ETC	ET20612	Digital system design	3	1	-	20	15	15	50	70	120	4
4	ETC	ET20613	Wireless communication	3	1	-	20	15	15	50	70	120	4
5	ETC	ET20614	VLSI and microelectronics	3	1	-	20	15	15	50	70	120	4
6	ETC	ET20615	Microwave and radar engineering	4	1	-	20	15	15	50	70	120	5
7	ETC	ET20621	VLSI and digital system design lab	-	-	3	30	-	-	30	20	50	2
8	ETC	ET20622	Microcontroller and embedded system lab	-	-	3	30	-	-	30	20	50	2
9	ETC	ET20623	Microwave and RF lab	-	-	3	30	-	-	30	20	50	2
10	EN		I & E Skill	-	-	2	25	-	-	25	0	25	1
11			Discipline	-	-	-	25	-	-	25	0	25	1
			Total	19	6	11	260	90	90	440	480	920	33

ELECTIVE 2			
S. No	BoS	Sub. Code	Subject Name
1	ETC	ET20631	Optoelectronic devices and circuits
2	ETC	ET20632	Advanced Microprocessors
3	ETC	ET20633	Neural networks and fuzzy logic.
4	ETC	ET20634	Industrial Instrumentation & automation
5	ETC	ET20635	Adaptive Signal Processing
6	ETC	ET20636	Consumer Electronics

NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR
DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION

Semester: 6 **Code: ET20611**
Subject: Data Communication and Networking
Credits: 4
Total Theory Periods: 30 **Total Tutorial Periods: 10**

UNIT I
INTRODUCTION TO INTERNET: Network edge, end systems, clients, servers, connectionless and connection oriented services, Network code, Access networks, ISPs and internet backbone, Delay and loss in packet switched network. LAYERED ARCHITECTURE: Protocols services and layering, OSI reference model, overview of TCP/IP, Berkeley API, Introductory socket programming in C, Application layer protocols and TCP/IP utilities.

UNIT II
DATA LINK LAYER: Peer-to-peer protocols and service models, ARQ protocols and reliable data transfer service, stop-and wait, go-back-N, selective repeat, sliding window flow control, timing recovery for synchronous service, TCP reliable stream service and flow control. Data link controls: Framing, HDLC data link control, link sharing using packet multiplexers.

UNIT III
MEDIUM ACCESS CONTROL: Random access, ALOHA, Slotted ALOHA, CSMA, CSMA CD, Scheduling approaches to medium access control, reservation systems, polling, token-passing rings, comparisons, Delay performance of MAC: Performance of channelization with bursty traffic, performance of polling and token ring, random access and CSMACD. Local area networks: LAN protocols, Ethernet, token ring, wireless LAN and IEEE 802.11 standard.

UNIT IV
PACKET SWITCHING NETWORKS: Packet network topology, datagrams and virtual circuit, routing in packet networks, Shortest-path routing, ATM networks, traffic management at packet level, traffic management at flow level, traffic management at the flow-aggregate level.

UNIT V
TCP/IP: Architecture and protocol, IP packet, addressing, subnet, IP routing, CIDR, address resolution, reverse address resolution, fragmentation and reassembly, ICMP, IPv6, UDP, Transmission control protocol, internet routing protocols, multicast routing, DHCP, NAT and mobile IP.

Text Book:

1. Communication Networks, 2 ed., A Leon-Garcia, I Widjaja, McGraw Hill Education India.
2. Computer Networking: A top down approach, 5 ed., J F Kurose, K W Ross, Pearson Education.
3. Behrouz A. Forouzan, “Data communication and Networking”, Tata McGraw-Hill, 2004.

Reference Books:

1. Data Networks, 2 ed, D P Bertsekas, R G Gallagar, Prentice Hall.
2. Analysis of Computer and Communication Networks, F Gebali, Springer 2008.

NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR
DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION

Semester: 6 **Code: ET20612**
Subject: Digital System Design
Credits: 4
Total Theory Periods: 30 **Total Tutorial Periods: 10**

UNIT 1
INTRODUCTION TO DIGITAL SYSTEM DESIGN: Device technologies, Overview of PLDs, CPLD, FPGA, System representation, Levels of abstraction, Development tasks and EDA software, Development flow, Hardware description language, VHDL in development flow, Basic VHDL concepts.

UNIT II
BASIC LANGUAGE CONSTRUCTS OF VHDL: Skeleton of VHDL program, Lexical elements and program format, Objects, Data type and operators, Concurrent Signal Assignment: Combinational versus sequential circuits, Signal assignment statements, conditional signal assignment, Selected signal assignment, Conditional versus selected signal assignment statements, Synthesis guidelines, Important sequential statements of VHDL.

UNIT III
SYNTHESIS OF VHDL CODE: Fundamental limitation of EDA software, Realization of VHDL operators, Realization of data types, VHDL synthesis flow, Timing considerations, Combinational Circuit Design Principles: Derivation of efficient HDL description, Operator sharing, Functionality sharing, Layout-related circuits.

UNIT IV
SEQUENTIAL CIRCUIT DESIGN: Synchronous circuits, Inference of basic memory elements, Timing analysis, Poor design practices and remedies, counters, Registers as temporary storage, Pipelined design, Synthesis guidelines.

UNIT V
FINITE STATE MACHINE: Overview of FSM, FSM representation, Timing and performance of FSM, Moore machine versus Mealy machine, VHDL representation of an FSM, State assignment, Moore output buffering, Some FSM design examples – edge detection circuit, arbiter, DRAM strobe generation, FSM based binary counter.

Text Books:

1. Principles of Digital System Design using VHDL, C H Roth, L K John, Cengage Learning, New Delhi, 1998.
2. Switching & Finite Automata Theory, Zvi Kolavi, Tata McGraw Hill, New Delhi.
3. Fundamentals of Digital Logic with VHDL Design, S Brown, Z Vranesis, Tata McGraw Hill, New Delhi 2003.
4. RTL Hardware Design using VHDL, Pong P Chu, John Wiley & Sons, USA, 2006.

NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR
DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION

Semester: 6 **Code: ET20613**
Subject: Wireless Communication
Credits: 4
Total Theory Periods: 30 **Total Tutorial Periods: 10**

UNIT I
PATH LOSS AND SHADOWING**:** Radio Wave Propagation, Transmit and Receive Signal Models, Free-Space Path Loss, Ray Tracing, Two-Ray Model, The Okumura Model, Hata Model, Shadow Fading. STATISTICAL MULTIPATH CHANNEL MODELS: Time-Varying Channel Impulse Response, Narrowband Fading Models, Autocorrelation, Cross Correlation, and Power Spectral Density, Envelope and Power Distributions, Level Crossing Rate and Average Fade Duration, Wideband Fading Models, Power Delay Profile, Coherence Bandwidth, Doppler Power Spectrum and Channel Coherence Time.

UNIT II
CAPACITY OFWIRELESS CHANNELS: Capacity in AWGN, Capacity of Flat-Fading Channels, Channel and System Model, Channel Distribution Information (CDI) Known, Channel Side Information at Receiver, Channel Side Information at Transmitter and Receiver, Capacity with Receiver Diversity, Capacity Comparisons, Capacity of Frequency-Selective Fading Channels, Time-Invariant Channels, Time-Varying Channels.

UNIT III
Equalizer Noise Enhancement, Equalizer Types, Folded Spectrum and ISI-Free Transmission, Linear Equalizers, Zero Forcing (ZF) Equalizers, Minimum Mean Square Error (MMSE) Equalizer, Maximum Likelihood Sequence Estimation, Decision-Feedback Equalization, Other commonly used Equalization Methods, Adaptive Equalizers: Training and Tracking.

UNIT IV
SPREAD SPECTRUM: Spread Spectrum Principles, Direct Sequence Spread Spectrum (DSSS), DSSS System Model, Spreading Codes for ISI Rejection: Random, Pseudorandom, and *m*-Sequences, Synchronization, RAKE receivers, Frequency-Hopping Spread Spectrum (FHSS), Multiuser DSSS Systems, Spreading Codes for Multiuser DSSS, Downlink Channels, Uplink Channels, Multiuser Detection, Multicarrier CDMA, Multiuser FHSS Systems.

UNIT V
MULTICARRIER MODULATION: Data Transmission using Multiple Carriers, Multicarrier Modulation with Overlapping Sub-channels, Mitigation of Subcarrier Fading, Coding with Interleaving over Time and Frequency, Frequency Equalization, Precoding, Adaptive Loading, Discrete Implementation of Multicarrier, DFT and its Properties, Cyclic Prefix, Orthogonal Frequency Division Multiplexing (OFDM), Matrix Representation of OFDM, Vector Coding, Challenges in Multicarrier Systems, Case Study: The IEEE 802.11a Wireless LAN Standard.

Text books:

1. Wireless communication, A Goldsmith, Cambridge University Press, 2005.
2. Wireless communication, T S Rappaport, PHI, New Delhi.

NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR
DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION

Semester: 6 **Code: ET20614**
Subject: VLSI and Microelectronics
Credits: 4
Total Theory Periods: 30 **Total Tutorial Periods: 10**

UNIT I
Introduction, Trends & Projections in VLSI Circuits, Flow diagram of VLSI Circuit, Design and VLSI Design issues. Stick Diagrams; Physical Design Rules; Layout Designing; Euler's Rule for VLSI Physical Design.

UNIT II
MOSFET fundamentals, Enhancement Mode MOSFETs, Depletion Mode MOSFETs, Weak & strong Inversion Conditions, Threshold Voltage Concept in MOSFETs, IV Characteristics of a MOSFET, Limitations in IV Model and MOSFET capacitiance.

UNIT III
Basic VLSI Design Styles-NMOS, CMOS Process flow; Noise Margin; Inverter Threshold Voltage; NMOS Inverter design and characteristics; CMOS Inverter Design and Properties; CMOS transmission gates, Delay, Power Dissipation and scaling in CMOS circuits.

UNIT IV
Parallel & Series Equivalent circuits; Static CMOS Circuit Design: case study; VLSI Interconnects. High Speed Dynamic CMOS logic families; Precharge-Evaluate logic; Dynamic CMOS logic circuits, cascading , charge sharing and clock distribution.

UNIT V
Memory / Regular Structure Design; ROM Design, SRAM and DRAM Design.

Text Books

1. CMOS Digital Integrated Circuits-Analysis & Design, S.M. Kang & Y. Leblibici, TMH, Ed. 2003.
2. Principles of CMOS VLSI Design: A System Perspective, N.H.E. Weste & K. Eshraghian, Pearson Education India, 2004.

Reference Books

1. Digital Integrated Circuits-A Design Perspective, J.M. Rabaey, PHI.
2. Introduction to VLSI, K. Eshraghian & Pucknell, PHI.

NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR
DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION

Semester: 6 **Code: ET20615**
Subject: Microwave and Radar Engineering
Credits: 5
Total Theory Periods: 40 **Total Tutorial Periods: 10**

UNIT I
Microwave Components: Rectangular cavity resonators; Q of a cavity resonator; Re-entrant cavities; Slow-wave structure; Microwave hybrid circuits; S-parameters and their properties; Waveguide tees ; Hybrid ring; Waveguide corners bends and twists; Two hole directional coupler; S- Matrix; Circulators and Isolators; Hybrid couplers.

UNIT – II
Microwave Linear Beam and Crossed-Field Tubes: Failure of conventional tube at high frequency; Klystron-Velocity modulation; Bunching; output power and loading; Reflex klystron-Velocity modulation; power output and efficiency and electronic admittance; Helix travelling wave tubes; amplification process; Conventional current; Electric field wave modes; Basic principle of coupled cavity; Magnetron-Types and Principles of operation; Modes of oscillation; Strapping; pi-mode separation.

UNIT – III
Microwave Devices: Transistors, Tunnel Diodes and Microwave FETs: Structure; Operation; Characteristics and Power frequency limitations of microwave transistors; Tunnel diodes and Field-Effect Transistors. Transfer Electron Devices: Gunn diode; Gunn effect; Principle and Mode of operation; Microwave generation and amplification Tunnel Diode; PIN diode and Crystal diode. Modulator; Switches, Avalanche Transit- Time Devices: Physical Structure; Principle of operation; Characteristics; Power output and Efficiency of IMPATT, TRAPATT and BARITT diodes; Parametric amplifiers.

UNIT – IV
Microwave Measurement: Microwave bench; Precautions; Power measurement; Bolometric method; Attenuation; VSWR; Impedance, Frequency and Q of the Cavity.

UNIT – V
Principles and Applications of Radar: Basic Radar, Radar Block Diagram, Radar Frequencies, Applications of Radar, Radar Range Equation, MTI and Pulse Doppler Radar: Introduction to Doppler and MTI Radar, delay line cancellers, staggered PRF. Range gated Doppler filter, limitations to MTI performance. Tracking with Radar, Monopulse Tracking, Conical Scan and Sequential Lobing, Limitations to Tracking Accuracy, Low Angle Tracking, Tracking in range, Comparison of Trackers.

Text Books:

1. Microwave Devices and Circuits by Samuel Y. Liao, 3rd Ed., Pearson Education.
2. Foundations of Microwave Engineering by R .E. Collin, TMH Pub.
3. Introduction to Radar Systems by M.I Skolnik, TMH Pub. Co.

Reference Books:

1. Microwave Principles by Reich.
2. Microwaves, Gupta, New Age International Publishers.
3. Microwave and Radar Engg., M. Kulkarni, Umesh Publication.

Semester: 6 **Code: ET20621**
Subject: VLSI and Digital System Design Laboratory
Credits: 2

Lab assignments based on ET20612 Digital System Design and ET20614 VLSI and Microelectronics.

Semester: 6 **Code: ET20622**
Subject: Microcontroller and Embedded Systems Laboratory
Credits: 2

Lab assignments based on ET20514 Microcontroller and Embedded Systems.

Semester: 6 **Code: ET20623**
Subject: Microwave and RF Laboratory
Credits: 2

Lab assignments based on ET20615 Microwave and Radar Engineering.

NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR
DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION

Semester: 6 **Code: ET20631**
Subject: Optoelectronic Devices and Circuits
Credits: 4
Total Theory Periods: 30 **Total Tutorial Periods: 10**

UNIT I
Optical processes in semiconductors – electron hole recombination, absorption, Franz-Keldysh effect, Stark effect, quantum confined Stark effect, deep level transitions, Auger recombination (10 hours)

UNIT II
Lasers – threshold condition for lasing, line broadening mechanisms, axial and transverse laser modes, heterojunction lasers, distributed feedback lasers, quantum well lasers, tunneling based lasers, modulation of lasers. (8 hours)

UNIT III
Optical detection – PIN, APD, modulated barrier photodiode, Schottky barrier photodiode, wavelength selective detection, microcavity photodiodes. (8 hours)

UNIT IV
Optoelectronic modulation - Franz-Keldysh and Stark effect modulators, quantum well electro-absorption modulators, electro-optic modulators, quadratic electro-optic effect quantum well modulators, optical switching and logic devices (8 hours)

UNIT V
Optoelectronic ICs – hybrid and monolithic integration, materials and processing, integrated transmitters and receivers, guided wave devices (8 hours)

Text Books:

1. Semiconductor Optoelectronic Devices, Pallab Bhattacharya, 2nd Ed; Pearson Education, 2002
2. Photonics: Optical Electronics in modern communication, Amnon Yariv & Pochi Yeh, 6th Ed; Oxford Univ. Press, 2006
3. Fundamentals of Photonics, B E Saleh and M C Teich, Wiley-Interscience; 1991

NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR
DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION

Semester: 6 **Code: ET20632**
Subject: Advanced Microprocessors
Credits: 4
Total Theory Periods: 30 **Total Tutorial Periods: 10**

UNIT I
ADVANCED MICROPROCESSOR ARCHITECTURE: Internal Microprocessor Architecture-Real mode memory addressing – Protected Mode Memory addressing –Memory paging - Data addressing modes – Program memory addressing modes – Stack memory addressing modes- Data movement instructions – Program control instructions- Arithmetic and Logic Instructions.

UNIT II
INTRODUCTION TO INTEL 80286, 80386 & 80486: Introduction to 80286, Intel 80386 Microprocessor, Architecture, Pins & Signals, Memory System Registers, 80386 Memory Management, Paging Technique, Protected Mode Operation, brief introduction to 80387 Math Coprocessor. Intel 80486.

UNIT III
PENTIUM PROCESSORS: Introduction to Pentium Microprocessor – Special Pentium registers- Branch Prediction Logic, Floating Point Module, Cache Structure, and Superscalar Architecture. Pentium memory management – New Pentium Instructions –Pentium Processor –Special Pentium pro features – Pentium 4 processor.

UNIT IV
16-BIT MICRO CONTROLLERS: 8096/8097 Architecture-CPU registers –RALU-Internal Program and Data memory Timers-High speed Input and Output –Serial Interface-I/O ports –Interrupts –A/D converter- Watch dog timer –Power down feature –Instruction set- External memory Interfacing – External I/O interfacing.

UNIT V
RISC PROCESSORS AND ARM: The RISC revolution – Characteristics of RISC Architecture – The Berkeley RISC – Register Windows – Windows and parameter passing – Window overflow – RISC architecture and pipelining – Pipeline bubbles – Accessing external memory in RISC systems – Reducing the branch penalties – Branch prediction – The ARM processors – ARM registers – ARM instructions – The ARM built-in shift mechanism – ARM branch instructions – sequence control – Data movement and memory reference instructions.

Text Books:

1. The Intel Microprocessors 8086/8088, 8086, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4, Architecture, Programming and interfacing, Barry B.Brey, Prentice Hall of India Private Limited, New Delhi, 2003.
2. Design with Microcontroller, John Peatman, McGraw Hill Publishing Co Ltd, New Delhi.
3. The principles of computer Hardware, Alan Clements, Oxford University Press, 3rd Edition, 2003.

Reference Books:

1. The concepts and feature of micro controllers 68HC11, 8051 and 8096, Rajkamal, S Chand Publishers, New Delhi.

NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR
DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION

Semester: 6 **Code: ET20633**
Subject: Neural Networks and Fuzzy Logic
Credits: 4
Total Theory Periods: 30 **Total Tutorial Periods: 10**

UNIT I
Introduction to ANS Technology: Elementary Neurophysiology, Models of a Neuron, Neural Networks viewed as directed graphs, Feedback, from neurons to ANS, Artificial Intelligence and Neural Networks.

UNIT II
Learning and Training: Hebbian, Memory based, Competitive, Error-Correction Learning, Credit Assignment. Problem: Supervised and Unsupervised learning, Memory models, Recall and Adaptation. Network Architectures, Single-layered Feed-forward Networks, Multi-layered Feedforward Networks, Recurrent Networks, Topologies.

UNIT III
Algoritms for ANN: Activation and Synaptic Dynamics, Stability and Convergence. A Survey of Neural Network Models : Single-layered Perceptron – least mean square algorithm, Multi-layered Perceptrons – Back propagation Algorithm, XOR – Problem, The generalized Delta rule, BPN Applications, Adalines and Madalines – Algorithm and applications.

UNIT IV
Radial basis functions, introduction to neural network signal processing , pattern detection , character recognition, Signal processing using multilayer perceptron, structure of multilayer perceptron, training the MLP.

UNIT V
Adaptive Fuzzy Systems: Introduction to Fuzzy sets and operations, Examples of Fuzzy logic, Fuzzy Associative memories, Fuzziness in neural networks, Comparison of Fuzzy and neural Truck-Backer upper control systems.

Text Books:

1. Neural Network: A Comprehensive Foundation, Haykin, Pearson Education.
2. Neuro-Fuzzy and Soft-Computing – A computational approach to learning and machine intelligence; Jang, Sun and Mizutani; Prentice Hall of India.

Reference Books:

1. Neural Networks, Freeman, Pearson Education
2. Fundamentals of Artificial Neural Networks, Hassoun, PHI.
3. Artificial Neural Networks by B. Yagna Narayan, PHI.

NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR
DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION

Semester: 6 **Code: ET20634**
Subject: Industrial Instrumentation & Automation
Credits: 4
Total Theory Periods: 30 **Total Tutorial Periods: 10**

UNIT I
Instrument Characteristics: Transducer performance characteristics, Generalized performance of systems, Static terms and characteristics, Dynamic terms and characteristics, standard test inputs, zero, first and second order instruments and their responses, Higher order systems, calibration and standards, process of calibration, standards for calibration.

UNIT II
Pressure Measurement: Terminology, Units; Manometers – Piezometer, U-Tube Double Column Manometer, Single Column Manometer, U-Tube Differential Ma nometer; Advantages and Limitations; Bourdan Gauge; ring balance manometer, bell type pressure gauges, elastic pressure transducers, low pressure gauges, Dead Weight Piston Gauge, Servo Operated Manometer, Feedback Pneumatic Load Cell.

UNIT III
Temperature Measurement: Types of temperature measuring instruments; Liquid-in-glass thermometers; Bimetallic Thermometers; Thermocouples, Laws of thermocouples, Elements of thermoelectric pyrometers, Resistance thermometers; Thermistors; Radiation and Optical Pyrometers, Temperature Balance Systems, Heat Flow Balance Systems.

UNIT IV
Flow Measurement: Classification of flow measurement techniques, variable head meters and related theory for incompressible fluids, Nozzle, Orifice, Venturi, Pitot Tube, Anemometers, Turbine Meter, Current Meter, Electromagnetic Flow Meter, Ultrasonic Flow Meter, Variable Area Meters, Variable Head and Area Meters, Quantity Meters, Servo Operated Electromagnetic Flow Meter.

UNIT V
Introduction to Process Control: Control Systems; Proce ss control principles; Servomechanisms; Process Control Block Diagram; Process control system evaluation, Analog and Digital Processing, Time Response. Final Control: Final Control Operation; Signal Conversions; Actuators; Control Elements, Hydraulic and Pneumatic Control Systems.

Text Books:

1. Transducers and Instrumentation; Murty, D.V.S.; PHI, 10th print 2003
2. Process Control Instrumentation Technology; Johnson, C.; PHI, 4 th Edition

Reference Books:

1. Sensors and Transducers; Patranabis, D.; PHI, 2nd Edition
2. Industrial Control & Instrumentation, W. Bolton, University Press.
3. Electronic Measurements and Instrumentation: Oliver and Cage: TMH.
4. Electronic Instrumentation, H.S. Kalsi, 2 nd Ed., TMH.
5. Mechanical and Industrial Measurements; Jain, R.K.; Khanna Publ., 2000

NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR
DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION

Semester: 6 **Code: ET20635**
Subject: Adaptive Signal Processing
Credits: 4
Total Theory Periods: 30 **Total Tutorial Periods: 10**

UNIT I
Introduction: Definition and characteristics, general properties,open and closed loop adaptation, 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 components.

UNIT II
Theory of Adaptation with Stationary Signals: Input correlation matrix, Eigen values 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

UNIT III
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.

UNIT IV
Adaptive Algorithms: Least mean square algorithm, convergence, learning curve noise in Weight vector misadjustmentand performances of LMS algorithms, sequential regression algorithm, adaptive recursive LMS algorithm, random search algorithm.

UNIT V
An ideal : The LMS / Newton Algorithm, properties of the LMS / Newton Algorithm, the sequential regression algorithm , adaptive recursive filters random search algorithm , lattice structures, the adaptive lattice predictor, adaptive filters with orthogonal signals

Text Book:
1. Adaptive signal processing, Bernard Widrow, Samuel D. Stearns.

NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR
DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION

Semester: 6 **Code: ET20636**
Subject: Consumer Electronics
Credits: 4
Total Theory Periods: 30 **Total Tutorial Periods: 10**

UNIT I
Microphones: construction, working principles and applications of microphones, their types viz- Carbon, moving coil, velocity, crystal, condenser, cordless etc. Loud Speaker: Direct radiating, horn loaded woofer, tweeter, mid range, multi-speaker system, baffles and enclosures, Sound recording on magnetic tape, its principles, block diagram, and tape transport mechanism Digital sound recording on tape and disc, CD system Hi-Fi system, pre-amplifier, amplifier and equalizer system, stereo amplifiers.

UNIT II
Monochrome TV Communication: Elements of TV communication system. Scanning- its need for picture transmission. Need for synchronizing and blanking pulses. Progressive scanning- Gross structure filters, interlaced scanning, resolution and band width requirement, tonal gradation. Composite Video signal (CVS) at the end of even and odd fields. equalizing pulses and their need Monochrome picture tube – construction and working, comparison of magnetic and electric deflection of beam. Construction and working of camera tube: vidicon and plumbicon, Block diagram of TV camera and the transmitter chain.

UNIT III
Block diagram of a TV receiver: function of each block and waveform at the input and output of each block. Frequency range of various VHF bands and channels used in India. Major specification of the CCIR. Concept of positive and negative modulation VSB Transmission
Turner. Typical circuits of scanning and EHT stages of TV receiver, keyed AGC, function and location of brightness contrast V-hold, H-hold of centering control. Identification of faulty stage by analyzing the symptoms and basic idea of a few important faults and there remedies, Colour Schemes, Introduction to PAL, NTSC, SECAM systems, Block diagram of PAL TV receiver, explanation and working.

UNIT IV
Colour TV: Primary colours, tristimulus values, trichromatic coefficients, concepts of additive and subtracting mixing of colours, concepts of luminance, Hue and Saturation, Representation of a colour in colour triangle, non spectral colour, visibility curve, Compatibility of colour TV system with monochrome system. Block diagram of colour TV camera, Basic colour TV system-NTSC, SECAM, and PAL their advantages and disadvantages. Construction and working principles of trinitron and PIL types of colour picture tubes. Concept of convergence, purity, beam shifting, Need for luminance signal and band sharing by colour signals, subcarriers frequency, colour difference signal and its need, synchronous quadratic modulation and representation of a colour by a vector, burst signal and its need, chrominance signal. Block diagram of PAL TV receiver, explanation and working

UNIT V
Cable Television: Block diagram and principles of working of cable TV and DTH, cable TV using internet. VCR, VCD and DVD: Principle of video recording on magnetic tapes, block diagram of VCR, VHS tape transport mechanism. Video Camera: Study of VCD and DVD.

Text Books

1. Colour Television-principles & practice R.R Gulati by Wiley Eastern Limited, New Delhi
2. Colour Television & Video Technology by A.K. Maini CSB Publishers
3. VCR-principles, maintenance & repair by S.P. Sharma, Tata Mc Graw Hill, New Delhi

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