TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

ELECTRONICS AND COMMUNICATION ENGINEERING-R17

COURSE STRUCTURE & SYLLABUS

IV YEAR I SEMESTER

S. No	Course Code	Course Title	L	T	P	Credits
1	**A47PC1**	Microwave Engineering	4	0	0	4
2	**A47PE2**	**Professional Elective - IV** **A47PE2-I:** Telecommunication Switching Systems and Networks **A47PE2-II:** RF Circuit Design **A47PE2-III:** Artificial Neural Networks	4	0	0	4
3	**A47PE3**	**Professional Elective - V** **A47PE3-I:** Cellular and Mobile Communications **A47PE3-II:** Electronic Measurements and Instrumentation **A47PE3-III:** Information Theory And Coding	4	0	0	4
4	**A47OE4**	**Open Elective III**	4	0	0	3
5	**A47PE5**	**Professional Elective - VI** **A47PE5- I:** CMOS Analog Integrated Design **A47PE5- II:** CMOS Digital Integrated Design **A47PE5- III:** Mixed Signal Design	4	0	0	4
6	**A47HS6**	Management Science	4	0	0	4
7	**A47PC7**	VLSI and E-CAD Lab	0	0	3	2
8	**A47PC8**	Microwave Engineering Lab	0	0	3	2
Total Credits						**27**

IV YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	**A48PE1**	**Professional Elective - VII** **A48PE1-I:** Optimization Techniques **A48PE1-II:** Embedded Systems Design **A48PE1-III:** Satellite Communications	3	0	0	3
2	**A48PE2**	**Professional Elective - VIII** **A48PE2-I:** Optical Communications **A48PE2-II:** Wireless Communications and Networks **A48PE2-III:** Principles of Electronic Communications	3	0	0	3
3	**A48OE3**	**Open Elective – IV**	3	0	0	3
4	**A48PW4**	Industry Oriented Mini Project	0	0	0	2
5	**A48PC5**	Seminar	0	0	6	2
6	**A48PW6**	Major Project	0	0	15	9
7	**A48PC7**	Comprehensive Viva	0	0	0	2
Total Credits						**24**

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ELECTRONICS AND COMMUNICATION ENGINEERING-R17

MICROWAVE ENGINEERING – A47PC1

B. Tech IV Year I Semester **L/T/P/ C**
4/0/0/ 4

COURSE OBJECTIVES:

This is a core course in Microwave Communications domain, and covers contents related to Microwave theory and techniques. The main objectives of the course are:

1. To get familiarized with microwave frequency bands, their applications and to understand the limitations and losses of conventional tubes at these frequencies.
2. To develop the theory related to microwave transmission lines, and to determine the characteristics of rectangular waveguides, microstrip lines, and different types of waveguide components and ferrite devices.
3. To distinguish between different types of microwave tubes, their structures and principles of microwave power generation, and to characterize their performance features and applications - at tube levels as well as with solid state devices.
4. To impart the knowledge of Scattering Matrix, its formulation and utility, and establish the S-Matrix for various types of microwave junctions.
5. To understand the concepts of microwave measurements, identify the equipment required and precautions to be taken, and get familiarized with the methods of measurement of microwave power and various other microwave parameters.

COURSE OUTCOMES:

Having gone through this course covering different aspects of microwave theory and techniques, the students would be able to

1. To analyze completely the rectangular waveguides, their mode characteristics, and design waveguides for solving practical microwave transmission line problems.
2. To distinguish between the different types of waveguide and ferrite components, explain their functioning and select proper components for engineering applications.
3. To distinguish between the methods of power generation at microwave frequencies, derive the performance characteristics of 2-Cavity and Reflex Klystrons, Magnetrons, TWTs and estimate their efficiency levels, and solve related numerical problems.
4. To realize the need for solid state microwave sources, understand the concepts of TEDs, RWH Theory and explain the salient features of Gunn Diodes and ATT Devices.
5. To establish the properties of Scattering Matrix, formulate the S-Matrix for various microwave junctions, and understand the utility of S-parameters in microwave component design.

UNIT – I:

Microwave Transmission Lines - I: Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides - Solution of Wave Equations in Rectangular Coordinates, TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies,

Filter Characteristics, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Mode Characteristics - Phase and Group Velocities, Wavelengths and Impedance Relations, Power Transmission, Impossibility of TEM Mode. Illustrative Problems, Micro strip Lines- Introduction, Z_o Relations, and Effective Dielectric Constant.

UNIT – II:

Cavity Resonators- Introduction, Rectangular Cavities, Dominant Modes and Resonant Frequencies, Q Factor and Coupling Coefficients, Illustrative Problems

Waveguide Components and Applications: Coupling Mechanisms - Probe, Loop, Aperture types. Waveguide Discontinuities - Waveguide Windows, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators - Different Types, Resistive Card and Rotary Vane Attenuators; Waveguide Phase Shifters - Types, Dielectric and Rotary Vane Phase Shifters, Waveguide Multiport Junctions - E plane and H plane Tees, Magic Tee. Directional Couplers - 2 Hole, Bethe Hole types, Illustrative Problems

Ferrites- Composition and Characteristics, Faraday Rotation, Ferrite Components - Gyrator, Isolator, Circulator.

UNIT – III:

Microwave Tubes: Limitations and Losses of conventional Tubes at Microwave Frequencies, Microwave Tubes - O Type and M Type Classifications, O-type Tubes : 2 Cavity Klystrons - Structure, Reentrant Cavities, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory - Expressions for O/P Power and Efficiency. Reflex Klystrons - Structure, Velocity Modulation and Applegate Diagram, Mathematical Theory of Bunching, Power Output, Efficiency, Oscillating Modes and O/P Characteristics, Illustrative Problems.

Helix TWTs: Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Amplification Process (qualitative treatment), Suppression of Oscillations, Gain Considerations.

UNIT – IV:

M-Type Tubes: Introduction, Cross-field Effects, Magnetrons - Different Types, Cylindrical Traveling Wave Magnetron -Modes of Resonance and PI-Mode Operation, Separation of PI-Mode, o/p characteristics, Illustrative Problems.

Microwave Solid State Devices: Introduction, Classification, Applications. TEDs - Introduction, Gunn Diodes - Principle, RWH Theory, Characteristics, Modes of Operation - Gunn Oscillation Modes, Introduction to Avalanche Transit Time Devices.

UNIT – V:

Scattering Matrix- Significance, Formulation and Properties, E plane and H plane Tees, Magic Tee, Circulator and Isolator, Illustrative Problems. Microwave Antennas-Fundamental Parameters, Definitions for Antennas, Radiation from Rectangular Antennas.

Microwave Measurements: Description of Microwave Bench - Different Blocks and their Features, Errors and Precautions, Microwave Power Measurement, Bolometers. Measurement of Attenuation, Frequency, Standing Wave Measurements - Measurement of Low and High VSWR, Cavity Q, Impedance Measurements.

TEXT BOOKS

1. Microwave Devices and Circuits - Samuel Y. Liao, Pearson, 3rd Edition, 2003.
2. Microwave Principles - Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, CBS

Publishers and Distributors, New Delhi,2004.

REFERENCE BOOKS

1. Foundations for Microwave Engineering - R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.
2. Microwave Engineering - G. S. Raghuvanshi, Cengage Learning India Pvt. Ltd., 2012.
3. Microwave Engineering Passive Circuits - Peter A. Rizzi, PHI, 1999.
4. Microwave Engineering - David M. Pozar, John Wiley & Sons (Asia) Pvt Ltd., 1989, 3r ed., 2011 Reprint.

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ELECTRONICS AND COMMUNICATION ENGINEERING-R17

TELECOMMUNICATION SWITCHING SYSTEMS AND NETWORKS – A47PE2-I

B.Tech IV Year I Semester **L/T/P/ C**
4/0/0/ 4

COURSE OBJECTIVES:

The Course is designed

1. To provide students with a balanced blend of theoretical and practical aspects regarding Telecommunication Switching System.
2. To expose through the evolution of switching systems from manual and Electromechanical systems to stored-program-controlled digital systems
3. To provide knowledge to the students regarding design and performance analysis of various switching systems.
4. To train the students about basic Telephone Networks structures and traffic engineering concepts
5. To inculcate students on various internet concepts like OSI reference model, LAN, WAN, WAN, Repeaters, bridges, routers and gateways
6. To provide a comprehensive coverage of data communication networks and ISDN

COURSE OUTCOMES:

Having gone through this course, the students would be able to

1. Demonstrate knowledge about Telecommunication Switching Systems.
2. Analyze different switching methodologies.
3. Differentiate between signaling methods used in Telecommunication Networks
4. Exhibit a good knowledge on data communication networks and ISDN and be able to differentiate LAN, MAN, WAN.
5. Demonstrate an ability to work on various Telecommunication Network concepts.
6. Demonstrate knowledge on modern telecommunication concepts like DSL & SONET.

UNIT – I:

Telecommunication Switching Systems: Introduction, Elements of switching systems, switching network configuration, Rotary switches, Uniselector, Two motion selector, Trunking principle ,principles of cross bar switching, Crossbar Switch Configuration, Cross point Technology, Crossbar Exchange Organization.

UNIT – II:

Electronic Space Division Switching: Stored Program Control, Centralized SPC, Distributed SPC, Software Architecture, Application Software, Enhanced services, Two- Stage Networks, Three-Stage Networks, n-Stage Networks.

Time Division Switching: Basic Time Division Space Switching, Basic Time Division Time Switching, Time Multiplexed Space Switching, Time Multiplexed Time Switching, Combination Switching, Three Stage Combination Switching, n - Stage Combinational Switching.

UNIT – III:

Telecommunications Traffic: Introduction; The Unit of Traffic, Congestion; Traffic Measurement, A Mathematical Model, Lost-Call Systems-Theory, Traffic Performance, Loss Systems in Tandem, Use of Traffic Tables, Queuing Systems-The Second Erlang Distribution, Probability of Delay, Finite Queue Capacity, Some Other Useful Results, Systems with a Single Server, Queues in Tandem, Delay Tables, Applications of Delay Formulae.

UNIT – IV:

Telephone Networks: Subscriber loop systems, switching hierarchy and routing, transmission plan, transmission systems, numbering plan, charging plan, Signaling techniques: In channel signaling, common channel signaling, Cellular mobile telephony.

Data Networks: Data transmission in PSTNs, Switching techniques for data transmission, data communication architecture, link to link layers, end to end layers, satellite based data networks, LAN, MAN, Internetworking.

UNIT – V:

Integrated Services Digital Network (ISDN): Introduction, motivation, new services, Network and protocol architecture, Transmission channels, User-Network interfaces, functional grouping, reference points, signaling, numbering, addressing, BISDN.

DSL Technology: ADSL, Cable Modem, Traditional Cable Networks, HFC Networks, Sharing, CM & CMTS and DOCSIS.

SONET: Devices, Frame, Frame Transmission, Synchronous Transport Signals, STS I, Virtual Tributaries, and Higher rate of service.

TEXT BOOKS

1. Tele communication switching system and networks - Thyagarajan Viswanath, PHI, 2000.
2. J. E Flood, “Telecommunications Switching and Traffic Networks,” Pearson Education,2006
3. Data Communication & Networking - B.A. Forouzan, TMH, 4th Edition,2004.

REFERENCE BOOKS

1. Digital telephony - J. Bellamy, John Wiley, 2nd edition,2001.
2. Data Communications & Networks - Achyut. S. Godbole, TMH,2004.
3. Principles of Communication Systems - H. Taub& D. Schilling, TMH, 2ndEdition, 2003.

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ELECTRONICS AND COMMUNICATION ENGINEERING-R17

RF CIRCUIT DESIGN – A47PE2-II

B.Tech IV Year I Semester **L/T/P/ C**
4/0/0/ 4

COURSE OBJECTIVES:

The course objectives are:

1. To educate students fundamental RF circuit and system design skills.
2. To introduce students the basic transmission line theory, single and multiport networks, RF component modeling.
3. To offer students experience on designing matching and biasing networks & RF transistor amplifier design.

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

1. Explore fundamental RF circuit and system design skills.
2. Understand the basic transmission line theory, single and multiport networks, RF component modeling.
3. Design matching and biasing networks & RF transistor amplifiers.

UNIT – I:

Introduction: Importance of RF Design-Dimensions and Units-Frequency Spectrum-RF Behaviour of Passive Components: High Frequency Resistors, High Frequency Capacitors, High Frequency Inductors.-Chip Components, and Circuit Board Considerations: Chip Resistors, Chip Capacitors, and Surface Mount Inductors.

Review of Transmission Lines: Types of Transmission Lines-Equivalent Circuit representation-R, L, C, G parameters of Different Line configurations-Terminated Lossless Transmission Lines-Special Terminations: Short Circuit, Open Circuit and Quarter Wave Transmission Lines- Sourced and Loaded Transmission Lines: Power Considerations, Input Impedance Matching, Return Loss and Insertion Loss.

UNIT – II:

Single and Multi-Port Networks: The Smith Chart: Reflection Coefficient, Normalized Impedance-Impedance Transformation: Standing wave Ratio, Special Transformation Conditions-Admittance Transformation-Parallel and Series RL & RC Connections-Basic Definitions of Single and Multi-Port Networks-Interconnecting Networks.

RF Filter Design: Scattering Parameters: Definition, Meaning, Chain Scattering Matrix, Conversion Between S- and Z-parameters, Signal Flow Chart Modeling, Generalization- Basic Resonator and Filter Configurations: Low Pass, High Pass, Band Pass and Band Stop type Filters-Filter Implementation using Unit Element and Kuroda's Identities Transformations-Coupled Filters.

UNIT – III:

Active RF Component Modelling: RF Diode Models: Nonlinear and Linear Models- Transistor Models: Large Signal and Small Signal BJT Models, Large Signal and Small Signal FET Models- Scattering Parameter, Device Characterization.

UNIT – IV:

Matching and Biasing Networks: Impedance Matching Using Discrete Components: Two Component Matching Networks, Forbidden Regions, Frequency Response and Quality Factor, T and Pi Matching Networks-Amplifier Classes of Operation and Biasing Networks: Classes of Operation and Efficiency of Amplifiers, Biasing Networks for BJT, Biasing Networks for FET.

UNIT – V:

RF Transistor Amplifier Design: Characteristics of Amplifiers- Amplifier Power Relations: RF Source, Transducer Power Gain, Additional Power Relations-Stability Considerations: Stability Circles, Unconditional Stability, And Stabilization Methods-Unilateral and Bilateral Design for Constant Gain- Noise Figure Circles- Constant VSWR Circles.

RF Oscillators and Mixers: Basic Oscillator Model: Negative Resistance Oscillator, Feedback Oscillator Design, Design steps, Quartz Oscillators- Fixed Frequency High Frequency Oscillator - Basic Characteristics of Mixers: Concepts, Frequency Domain Considerations, Single Ended Mixer Design, Single, and Double Balanced Mixers.

TEXT BOOKS

1. RF Circuit Design - Theory and Applications by Reinhold Ludwig, Pavel Bsetchko - Pearson Education India, 2000.
2. Radio Frequency and Microwave Communication Circuits - Analysis and Design by Devendra K.Misra - Wiley Student Edition - John Wiley & Sons, Inc.

REFERENCE BOOKS

1. Radio Frequency and Microwave Electronics - Illustrated by Matthew M.Radmanesh - PEI.
2. RF Circuit Design - Christopher Bowick, Cheryl Aljuni and John Biyler, Elsevier Science, 2008.
3. Secrets of RF Circuit Design by Joseph J.Carr, McGraw Hill Education, 2000.
4. Design of RF and Microwave Amplifiers and Oscillators, Peter L.D. Abrif, Artech House, 2000.
5. The Design of CMOS Radio Frequency Integrated Circuits by Thomas H.Lee, 2/e - Cambridge University Press, 2004.

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ELECTRONICS AND COMMUNICATION ENGINEERING-R17

ARTIFICIAL NEURAL NETWORKS – A47PE2-III

B.Tech IV Year I Semester **L/T/P/ C**
4/0/0/ 4

COURSE OBJECTIVES:

1. To understand the biological neural network and to model equivalent neuron models.
2. To understand the architecture, learning algorithm and issues of various feed forward and feedback neural networks.

COURSE OUTCOMES:

By completing this course the student will be able to:

1. Create different neural networks of various architectures both feed forward and feed backward.
2. Perform the training of neural networks using various learning rules.
3. Perform the testing of neural networks and do the perform analysis of these networks for various pattern recognition applications.

UNIT – I:

Introduction: A Neural Network, Human Brain, Models of a Neuron, Neural Networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks

Learning Process: Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive, Boltzmann Learning, Credit Assignment Problem, Memory, Adaption, Statistical Nature of the Learning Process

UNIT – II:

Single Layer Perceptrons: Adaptive Filtering Problem, Unconstrained Organization Techniques, Linear Least Square Filters, Least Mean Square Algorithm, Learning Curves, Learning Rate Annealing Techniques, Perceptron -Convergence Theorem, Relation Between Perceptron and Bayes Classifier for a Gaussian Environment

Multilayer Perceptron: Back Propagation Algorithm XOR Problem, Heuristics, Output Representation and Decision Rule, Computer Experiment, Feature Detection

UNIT – III:

Back Propagation: Back Propagation and Differentiation, Hessian Matrix, Generalization, Cross Validation, Network Pruning Techniques, Virtues and Limitations of Back Propagation Learning, Accelerated Convergence, Supervised Learning

UNIT – IV:

Self-Organization Maps (SOM): Two Basic Feature Mapping Models, Self-Organization Map, SOM Algorithm, Properties of Feature Map, Computer Simulations, Learning Vector Quantization, Adaptive Patter Classification

UNIT – V:

Neuro Dynamics: Dynamical Systems, Stability of Equilibrium States, Attractors, Neuro Dynamical Models, Manipulation of Attractors as a Recurrent Network Paradigm.

Hopfield Models - Hopfield Models, Computer Experiment

TEXT BOOKS

1. Neural Networks a Comprehensive Foundations, Simon Haykin, PHI edition.

REFERENCE BOOKS

1. Artificial Neural Networks - B. Vegnanarayana Prentice Hall of India P Ltd 2005.
2. Neural Networks in Computer Intelligence, Li Min Fu Mc Graw Hill Education 2003.
3. Neural Networks -James A Freeman David M S Kapura Pearson Education 2004.
4. Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House Ed.2006.

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CELLULAR AND MOBILE COMMUNICATIONS – A47PE3 -I

B. Tech IV Year I semester **L/T/P/ C**

4/0/0/ 4

COURSE OBJECTIVES:

The course objectives are:

1. To provide the student with an understanding of the Cellular concept, Frequency reuse, Hand-off strategies.
2. To enable the student to analyze and understand wireless and mobile cellular communication systems over a stochastic fading channel.
3. To provide the student with an understanding of Co-channel and Non Co-channel interferences.
4. To give the student an understanding of cell coverage for signal and traffic, diversity techniques and mobile antennas.
5. To give the student an understanding of frequency management, Channel assignment and types of handoff.

COURSE OUTCOMES:

By the end of the course,

1. The student will be able to analyze and design wireless and mobile cellular systems.
2. The student will be able to understand impairments due to multipath fading channel.
3. The student will be able understand the fundamental techniques to overcome the different fading effects.
4. The student will be able to understand Co-channel and Non Co-channel interferences
5. The student will be able to familiar with cell coverage for signal and traffic, diversity techniques and mobile antennas.
6. The student will have an understanding of frequency management, Channel assignment, and types of handoff.

UNIT – I:

Introduction to Cellular Mobile Radio Systems: Limitations of Conventional Mobile Telephone Systems, Basic Cellular Mobile System, First, Second, Third and Fourth Generation Cellular Wireless Systems, Performance Criteria, Uniqueness of Mobile Radio Environment- Fading - Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Operation Of Cellular Systems & Hexagonal Shaped Cells.

Fundamentals of Cellular Radio System Design: Concept of Frequency Reuse, Co- Channel Interference, Co-Channel Interference Reduction Factor, Desired C/I From a Normal Case in a Omni Directional Antenna System, System Capacity, Trunking and Grade of Service, Improving Coverage and Capacity in Cellular Systems- Cell Splitting, Sectoring, Microcell Zone Concept, Umbrella Cell Approach.

UNIT – II:

Co-Channel Interference: Introduction to Co-Channel Interference, Measurement Of Real Time Co-Channel Interference, Design of Antenna System, Antenna Parameters and Their Effects, Diversity Techniques-Space Diversity, Polarization Diversity, Frequency Diversity, Time Diversity.

Non-Co-Channel Interference: Adjacent Channel Interference, Near End Far End Interference, Cross Talk, Effects on Coverage and Interference by Power Decrease, Antenna Height Decrease, Effects of Cell Site Components.

UNIT – III:

Cell Coverage for Signal and Traffic: Signal Reflections in Flat And Hilly Terrain, Effect of Human Made Structures, Phase Difference Between Direct and Reflected Paths, Constant Standard Deviation, Straight Line Path Loss Slope, General Formula for Mobile Propagation Over Water and Flat Open Area, Near and Long Distance Propagation, Path Loss From a Point to Point Prediction Model in Different Conditions, Merits of Lee Model.

Cell Site and Mobile Antennas: Omni Directional and Directional Antennas, Space Diversity Antennas, Umbrella Pattern Antennas, Minimum Separation of Cell Site Antennas, Mobile Antennas, High Gain Antennas.

UNIT – IV:

Frequency Management and Channel Assignment: Numbering And Grouping, Setup Access And Paging Channels, Channel Assignments to Cell Sites and Mobile Units, Channel Sharing and Borrowing, Sectorization, Overlaid Cells, Non Fixed Channel Assignment.

UNIT – V:

Handoffs and Dropped Calls: Handoff Initiation, Types of Handoff, Delaying Handoff, Advantages of Handoff, Power Difference Handoff, Forced Handoff, Mobile Assisted and Soft Handoff, Intersystem Handoff, Introduction to Dropped Call Rates and their Evaluation.

TEXT BOOKS

1. Mobile Cellular Telecommunications - W.C.Y. Lee, Mc Graw Hill, 2nd Edn., 1989.
2. Wireless Communications - Theodore. S. Rapport, Pearson Education, 2nd Edn., 2002.
3. wireless communication and networks - Dalal, oxford university press

REFERENCE BOOKS

1. Principles of Mobile Communications - Gordon L. Stuber, Springer International, 2nd Edn., 2001.
2. Modern Wireless Communications - Simon Haykin, Michael Moher, Pearson Education, 2005.
3. Wireless Communications Theory and Techniques, Asrar U. H .Sheikh, Springer, 2004.
4. Wireless Communications and Networking, Vijay Garg, Elsevier Publications, 2007.
5. Wireless Communications - Andrea Goldsmith, Cambridge University Press, 2005.

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ELECTRONIC MEASUREMENTS AND INSTRUMENTATION – A47PE3-II

B. Tech IV Year I Semester **L/T/P/ C**

4/0/0/ 4

COURSE OBJECTIVES:

1. It provides an understanding of various measuring systems functioning and metrics for performance analysis.
2. Provides understanding of principle of operation, working of different electronic instruments viz. signal generators, signal analyzers, recorders and measuring equipment.
3. Provides understanding of use of various measuring techniques for measurement of different physical parameters using different classes of transducers.

Course Outcomes: On completion of this course student can be able to

1. Identify the various electronic instruments based on their specifications for carrying out a particular task of measurement.
2. Measure various physical parameters by appropriately selecting the transducers.
3. Use various types of signal generators, signal analyzers for generating and analyzing various real-time signals.

UNIT – I:

Block Schematics of Measuring Systems: Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag; Measuring Instruments: DC Voltmeters, D' Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments.

UNIT – II:

Signal Analyzers: AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillators. Signal Generators: AF,RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, Video Signal Generators, and Specifications

UNIT – III:

Oscilloscopes: CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and Frequency Specifications.

Special Purpose Oscilloscopes: Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs.

UNIT – IV:

Transducers: Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchros, Special Resistance Thermometers, Digital Temperature sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers.

UNIT – V:

Bridges: Wheat Stone Bridge, Kelvin Bridge, and Maxwell Bridge, Measurement of Capacitance - Schering Bridge, Measurement of frequency- Wien Bridge.

Measurement of Physical Parameters: Flow Measurement, Displacement Meters, Liquid level Measurement, Measurement of Humidity and Moisture, Velocity, Force, Pressure - High Pressure, Vacuum level, Temperature -Measurements, Data Acquisition Systems, Telemetry systems

TEXT BOOKS

1. Electronic Measurements and Instrumentation - K. Lal Kishore, Pearson Education 2010.
2. Electronic Instrumentation: H. S. Kalsi - Mc Graw Hill Education, 2nd Edition 2004.
3. Electronic Instrumentation and Measurements - David A. Bell, 3rd Edition Oxford Univ. Press, 2013.

REFERENCE BOOKS

1. Electronic Instrumentation and Measurements - David A. Bell, Oxford Univ. Press, 1997.
2. Modern Electronic Instrumentation and Measurement Techniques: A.D.Helbincs, W.D. Cooper: PHI 5th Edition 2003.
3. Electronic Measurements and Instrumentation: B.M. Oliver, J.M. Cage McGraw Hill Education, Reprint 2009.
4. Industrial Instrumentation: T.R. Padmanabham, Springer 2009.

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INFORMATION THEORY AND CODING – A47PE3-III

B. Tech IV Year I Semester **L/T/P/ C**
4/0/0/ 4

COURSE OBJECTIVES:

1. To understand the amount of information present in each message signal and how the capacity of the channel is described to allow maximum amount of information.
2. To assess the efficiency of given message signal using different coding techniques.
3. To understand the detection of errors and how to correct it also understand the exact location of error.
4. To understand the correction of errors and the minimum distance of error.
5. To understand the encoding message with parity data and decoding using Viterbi algorithm.

COURSE OUTCOMES:

At the end of the course, students will demonstrate the ability to:

1. Understand the concept of information and entropy.
2. Understand Shannon's theorem for coding.
3. Calculation of channel capacity.
4. Apply coding techniques.

UNIT – I:

Information Theory: Basics of information, entropy, conditional entropy, entropy for discrete ensembles, discrete memory less channel, bounds discrete channels, channel capacity, mutual information.

UNIT – II:

Source Coding: Source coding theorem-code efficiency, redundancy, variance; shannon's noisy coding theorem, shannon's noise less coding theorem, shannon's Hartley theorem application to continuous channel, shannon's fano coding, huffman coding.

UNIT – III:

Techniques of Coding and Decoding: Linear block codes: principle of block coding, matrix description of linear block codes, hamming codes, error detection and correction capabilities of hamming codes.

UNIT – IV:

Cyclic Codes: Algebric structure, syndrome calculation, error correction using syndrome vector, syndrome decoder for (n,k) block code, error correction capability, advantages and disadvantages of cyclic codes.

UNIT – V:

Convolution Codes: Analysis of convolutional encoders, Markov sources-code tree, trellis, state diagram for convolutional encoder, uniquely detectable codes, Viterbi algorithm, advantages and disadvantages of convolutional codes.

TEXT BOOKS

1. N. Abramson, Information and Coding, McGraw Hill, 1963.
2. M. Mansurpur, Introduction to Information Theory, McGraw Hill, 1987.
3. R.B. Ash, Information Theory, Prentice Hall, 1970.
4. Shu Lin and D.J. Costello Jr., Error Control Coding, Prentice Hall, 1983.

REFERENCE BOOKS

1. Principles of Communication Systems-Herbert Taub, Donald L schilling, Goutham Saha, 3rd Edition, McGraw Hill, 2008.
2. Digital and analog communication systems-Sam Shanmugam, John Wiley, 2005.
3. Digital communication—Simon Haykin, John Wiley, 2005.
4. Communication Systems-B.P.Lathi, BS Publications 2006.

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CMOS ANALOG INTEGRATED DESIGN – A47PE5-I
(Professional Elective -VI)

B. Tech IV Year I Semester **L/T/P/ C**
4/0/0/ 4

COURSE OBJECTIVES:

1. Introduction to modeling of MOS devices in analog point of view.
2. Concepts of active and passive components in analog IC.
3. Analyze and Design signal and differential amplifiers.
4. Design and operation of operational amplifiers.
5. Describe the operation of comparators.

COURSE OUTCOMES:

At the end of the course, students will be able to

1. Have basic knowledge about analog components.
2. Design sub-circuits using analog ICs.
3. Design of single stage and differential amplifiers.
4. Understand how to design operational amplifiers.
5. Design and analysis of comparators based application circuits.

UNIT – I:

MOS Devices and Modeling: The MOS Transistor, Passive Components- Capacitor & Resistor, Integrated circuit Layout, CMOS Device Modeling - Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Computer Simulation Models, Sub-threshold MOS Model.

UNIT – II:

Analog CMOS Sub-Circuits: MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors-Current mirror with Beta Helper, Degeneration, Cascode current Mirror and Wilson Current Mirror, Current and Voltage References, Band gap Reference.

UNIT – III:

CMOS Amplifiers: Inverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers, High Gain Amplifiers Architectures.

UNIT – IV:

CMOS Operational Amplifiers: Design of CMOS Op Amps, Compensation of Op Amps, Design of Two-Stage Op Amps, Power- Supply Rejection Ratio of Two-Stage Op Amps, Cascode Op Amps, Measurement Techniques of OP Amp.

UNIT – V:

Comparators: Characterization of Comparator, Two-Stage, Open-Loop Comparators, Other Open Loop Comparators, Improving the Performance of Open-Loop Comparators, Discrete-Time Comparators.

TEXT BOOKS

1. Philip E. Allen and Douglas R. Holberg, "CMOS Analog Circuit Design", Oxford University Press, International 2nd Edition/Indian Edition, 2010.
2. Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, "Analysis and Design of Analog Integrated Circuits", Wiley India, 5th Edition, 2010.

REFERENCE BOOKS

1. David A. Johns, Ken Martin, "Analog Integrated Circuit Design", Wiley Student Edition, 2013.
2. Behzad Razavi, "Design of Analog CMOS Integrated Circuits", TMH Edition.
3. Baker, Li and Boyce, "CMOS: Circuit Design, Layout and Simulation", PHI.

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CMOS DIGITAL INTEGRATED DESIGN – A47PE5-II

B. Tech IV Year I Semester **L/T/P/ C**
4/0/0/ 4

COURSE OBJECTIVES:

1. This course focuses on analysis and design of modern digital circuits.
2. Transistors are introduced and described from a digital point of view, and the performance of various circuits is derived and estimated.
3. CMOS digital circuits will be introduced and analyzed.
4. Have an understanding of the characteristics of CMOS circuit construction.
5. To teach fundamentals of CMOS Digital integrated circuit design such as importance of Pseudo logic, Combinational MOS logic circuits and Sequential MOS logic circuits.
6. To teach the fundamentals of Dynamic logic circuits and basic semiconductor memories which are the basics for the design of high performance digital integrated circuits

COURSE OUTCOMES:

1. Design CMOS inverters with specified noise margin and propagation delay.
2. Design memories with efficient architectures to improve access times, power consumption.
3. Implement efficient techniques at circuit level for improving power and speed of combinational and sequential circuits.
4. Able to understand the realization of different logic circuit designs for logic expressions and the importance of the circuit designs , the drawback of the designs both in combinational as well as sequential.
5. Able to know different types of memories, performance evaluation of each memory modules they can be able to think how to improve performance by taking different structures

UNIT – I:

MOS Design: Pseudo NMOS Logic - Inverter, Inverter threshold voltage, Output high voltage, Output Low voltage, Gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

UNIT – II:

Combinational MOS Logic Circuits: MOS logic circuits with NMOS loads, Primitive CMOS logic gates - NOR & NAND gate, Complex Logic circuits design - Realizing Boolean expressions using NMOS gates and CMOS gates , AOI and OIA gates, CMOS full adder, CMOS transmission gates, Designing with Transmission gates.

UNIT – III:

Sequential MOS Logic Circuits: Behavior of bistable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch, and edge triggered flip-flop.

UNIT – IV:

Dynamic Logic Circuits: Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS circuits.

UNIT – V:

Semiconductor Memories: Types, RAM array organization, DRAM - Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells, Flash Memory- NOR flash and NAND flash.

TEXT BOOKS

1. Ken Martin, "Digital Integrated Circuit Design", Oxford University Press, 2011.
2. Sung-Mo Kang, Yusuf Leblebici, "CMOS Digital Integrated Circuits Analysis and Design", TMH, 3rd Edition, 2011.

REFERENCE BOOKS

1. Ming-BO Lin, "Introduction to VLSI Systems: A Logic, Circuit and System Perspective", CRC Press, 2011.
2. Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, "Digital Integrated Circuits - A Design Perspective", 2nd Edition, PH.

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MIXED SIGNAL DESIGN-A47PE5-III

B. Tech IV Year I Semester **L/T/P/ C**
4/0/0/ 4

COURSE OBJECTIVES:
The student will be introduced to

1. Understand the Switched capacitors Circuits and Operation and Analysis, PLLS.
2. In this course, students can study Data Converter Fundamentals, Nyquist Rate A/D Converters.
3. Another main object of this course is to motivate the graduate students to study and to analyze the Oversampling Converters and Continuous-Time Filters.
4. The concepts of Continuous-Time Filters, CMOS Transconductors Using Triode and Active Transistors and MOSFET-C Filters.

COURSE OUTCOMES:
After going through this course the student will be able to

1. Understand the concepts of Switched Capacitor circuits.
2. Design and analysis of Nyquist Rate A/D Converters.
3. Extend the Mixed Signal Design to Different Applications.
4. Concepts of Oversampling Converters and Continuous-Time Filters.

UNIT – I:
Switched Capacitor Circuits: Introduction to Switched Capacitor circuits- basic building blocks, Operation and Analysis, Non-ideal effects in switched capacitor circuits, Switched capacitor integrators first order filters, Switch sharing, biquad filters.

UNIT – II:
Phased Lock Loop (PLL): Basic PLL topology, Dynamics of simple PLL, Charge pump PLLs-Lock acquisition, Phase/Frequency detector and charge pump, Basic charge pump PLL, Non-ideal effects in PLLs-PFD/CP non- idealities, Jitter in PLLs, Delay locked loops, applications.

UNIT – III:
Data Converter Fundamentals: DC and dynamic specifications, Quantization noise, Nyquist rate D/A converters- Decoder based converters, Binary-Scaled converters, Thermometer-code converters, Hybrid converters

UNIT – IV:
Nyquist Rate A/D Converters: Successive approximation converters, Flash converter, Two-step A/D converters, Interpolating A/D converters, Folding A/D converters, Pipelined A/D converters, Time-interleaved converters.

UNIT – V:

Oversampling Converters: Noise shaping modulators, Decimating filters and interpolating filters, Higher order modulators, Delta sigma modulators with multi-bit quantizers, Delta sigma D/A.

Continuous-Time Filters: Introduction to Gm-C Filters, Bipolar Transconductors, CMOS transconductors Using Triode and Active Transistors, BiCMOS Tran conductors, MOSFET-C Filters.

TEXT BOOKS

1. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition, 2002
2. Analog Integrated Circuit Design- David A. Johns,Ken Martin, Wiley Student Edition, 2013

REFERENCE BOOKS

1. CMOS Mixed-Signal Circuit Design - R. Jacob Baker, Wiley Interscience, 2009.
2. CMOS Analog Circuit Design -Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.

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MANAGEMENT SCIENCE - A47HS6

B. Tech IV Year I Semester **L/T/P/ C**
4/0/0/ 4

COURSE OBJECTIVES:

1. This course is intended to familiarize the students with the framework for the managers and leaders available for understanding and making decisions relating to issues related organizational structure, production operations, marketing, Human resource Management, product management and strategy.

COURSE OUTCOMES:

By the end of the course, the student will be in a position to

1. Plan an organizational structure for a given context in the organization carry out production operations through Work study.
2. Carry out production operations through Work study.
3. Understand the markets, customers and competition better and price the given products appropriately.
4. Ensure quality for a given product or service.
5. Plan and control the HR function better.
6. Plan, schedule and control projects through PERT and CPM.
7. Evolve a strategy for a business or service organization.

UNIT – I:

Introduction to Management and Organization: Concepts of Management and organization- nature, importance and Functions of Management, Systems Approach to Management - Taylor's Scientific Management Theory- Fayal's Principles of Management- Maslow's theory of Hierarchy of Human Needs- Douglas McGregor's Theory X and Theory Y - Hertzberg Two Factor Theory of Motivation - Leadership Styles, Social responsibilities of Management, Designing Organizational Structures: Basic concepts related to Organization - Departmentation and Decentralization, Types and Evaluation of mechanistic and organic structures of organization and suitability.

UNIT – II:

Operations and Marketing Management: Principles and Types of Plant Layout-Methods of Production(Job, batch and Mass Production), Work Study - Basic procedure involved in Method Study and Work Measurement - Business Process Reengineering(BPR) - Statistical Quality Control: control charts for Variables and Attributes (simple Problems) and Acceptance Sampling, TQM, Six Sigma, Deming's contribution to quality, Objectives of Inventory control, EOQ, ABC Analysis, Purchase Procedure, Stores Management and Store Records - JIT System, Supply Chain Management, Functions of Marketing, Marketing Mix, and Marketing Strategies based on Product Life Cycle, Channels of distribution.

UNIT – III:

Human Resources Management(HRM): Concepts of HRM, HRD and Personnel Management and Industrial Relations (PMIR), HRM vs PMIR, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating - Capability Maturity Model (CMM) Levels - Performance Management System.

UNIT – IV:

Project Management (PERT/ CPM): Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing (simple problems).

UNIT – V:

Strategic Management and Contemporary Strategic Issues: Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and Implementation, Generic Strategy alternatives. Bench Marking and Balanced Score Card as Contemporary Business Strategies.

TEXT BOOKS

1. Stoner, Freeman, Gilbert, Management, 6th Ed, Pearson Education, New Delhi, 2004.
2. P. Vijay Kumar, N. Appa Rao and Ashnab, Chnalill, Cengage Learning India, 2012.

REFERENCE BOOKS

1. Kotler Philip and Keller Kevin Lane: Marketing Management, Pearson, 2012.
2. Koontz and Weihrich: Essentials of Management, McGraw Hill, 2012.
3. Thomas N. Duening and John M. Ivancevich Management - Principles and Guidelines, Biztantra, 2012.
4. Kanishka Bedi, Production and Operations Management, Oxford Uiversity Press, 2012.
5. Samuel C. Certo: Modern Management, 2012.
6. Schermerhorn, Capling, Poole and Wiesner: Management, Wiley, 2012.
7. Parnell: Strategic Management, Cengage, 2012.
8. Lawrence R Jauch, R. Gupta and William F. Glueck: Business Policy and Strategic Management Science, McGraw Hill, 2012.

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VLSI & E-CAD LAB – A47PC7

B. Tech IV Year I Semester **L/T/P/ C**
0/0/3/ 2

COURSE OBJECTIVES:

1. To learn the HDL programming language.
2. To learn the simulation of basic gates using the basic programming language.
3. To learn the simulation of combinational circuits using programming language.
4. To learn the simulation of sequential circuits using programming language.
5. To learn the synthesis and layouts of analog and digital CMOS circuits.
6. To develop an ability to simulate and synthesize various digital circuits.

COURSE OUTCOMES:

At the end of the course, students will be able to:

1. Simulate various digital circuits.
2. Simulate and synthesize various CMOS circuits.
3. Understand the layout design rules for both static CMOS and dynamic clocked CMOS Circuits.
4. Develop an ability of designing of analog and digital CMOS circuits.
5. Design of Digital VLSI Circuits, stick diagram of circuits.
6. Design Entry & simulation of combinational and sequential circuits with test bench & functional verification.
7. Generation of configuration/fuse files for combinational and sequential circuits & implementation of the hardware using FPGA.
8. Design a schematic and simple layout for CMOS circuits, parasitic extraction.
9. Be able to complete a significant VLSI design project having a set of objective criteria and design constraints

Design and implementation of the following CMOS digital/analog circuits using **Cadence / Mentor Graphics / Synopsys /Equivalent** CAD tools. The design shall include Gate-level design, Transistor-level design, Hierarchical design, Verilog HDL/VHDL design, Logic synthesis, Simulation and verification, Scaling of CMOS Inverter for different technologies, study of secondary effects (temperature, power supply and process corners), Circuit optimization with respect to area, performance and/or power, Layout, Extraction of parasitics and back annotation, modifications in circuit parameters and layout consumption, DC/transient analysis, Verification of layouts (DRC, LVS)

LIST OF EXPERIMENTS:

E-CAD programs:

Programming can be done using any complier. Down load the programs on FPGA/CPLD boards and performance testing may be done using pattern generator (32 channels) and logic analyzer apart from verification by simulation with any of the front end tools.

1. HDL code to realize all the logic gates
2. Design of 2-to-4decoder
3. Design of 8-to-3 encoder (without and with priority)
4. Design of 8-to-1 multiplexer and 1-to-8demultiplexer
5. Design of 4 bit binary to gray code converter
6. Design of 4 bit comparator
7. Design of Full adder using 3 modeling styles
8. Design of flip flops: SR, D, JK,T
9. Design of 4-bit binary, BCD counters (synchronous/asynchronous reset) or any sequence counter
10. Design of MOD-n Counters

VLSI programs:

Introduction to layout design rules. Layout, physical verification, placement & route for complex design, static timing analysis, IR drop analysis and crosstalk analysis of the following:

1. Basic logic gates
2. CMOS inverter
3. CMOS NOR/ NAND gates
4. CMOS XOR and MUX gates
5. Static / Dynamic logic circuit (register cell)
6. Latch
7. Pass transistor
8. Layout of any combinational circuit (complex CMOS logic gate).
9. Analog Circuit simulation (AC analysis) - CS & CD amplifier

Note: *Any* ***SIX of*** *the above experiments from each part are to be conducted (Total 12)*

COURSE OBJECTIVES:

1. The goal of this course is to introduce students to the concepts and principles of the

MICROWAVE ENGINEERING LAB – A47PC8

B. Tech IV Year I Semester **L/T/P/ C**
0/0/3/ 2

advanced microwave engineering
2. To understand the operation of different types of Microwave sources.
3. Scattering parameters are defined and used to characterize devices and system behavior

COURSE OUTCOMES:

1. Gain knowledge and understanding of microwave analysis methods.
2. Be able to apply analysis methods to determine circuit properties of passive/active microwave devices.
3. Know how to model and determine the performance characteristics of a microwave circuit or system using computer aided design methods.
4. Have knowledge of how transmission and waveguide structures and how they are used as elements in impedance matching and filter circuits.

Note: Minimum of 12 experiments to be conducted

LIST OF EXPERIMENTS

1. Reflex Klystron Characteristics
2. Gunn Diode Characteristics
3. Directional Coupler Characteristics
4. VSWR Measurement of Matched load
5. VSWR measurement of with open and short circuit loads
6. Measurement of Waveguide Parameters
7. Measurement of Impedance of a given Load
8. Measurement of Scattering Parameters of a E plane Tee
9. Measurement of Scattering Parameters of a H plane Tee
10. Measurement of Scattering Parameters of a Magic Tee
11. Measurement of Scattering Parameters of an Isolator
12. Measurement of Scattering Parameters of a Circulator
13. Attenuation Measurement
14. Microwave Frequency Measurement

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ELECTRONICS AND COMMUNICATION ENGINEERING-R17

Optimization Techniques – A48PEI-I

B. Tech IV Year I Semester **L/T/P/ C**

3/0/0/ 3

COURSE OBJECTIVES:

1.To introduce various optimization techniques i.e classical, linear programming, transportation problem, simplex algorithm, dynamic programming

2.Constrained and unconstrained optimization techniques for solving and optimizing an electrical and electronic engineering circuits design problems in real world situations.

3.To explain the concept of Dynamic programming and its applications to project implementation.

COURSE OUTCOMES:

After completion of this course, the student will be able to

1. explain the need of optimization of engineering systems
2. understand optimization of electrical and electronics engineering problems
3. apply classical optimization techniques, linear programming, simplex algorithm, transportation problem
4. apply unconstrained optimization and constrained non-linear programming and dynamic programming
5. Formulate optimization problems.

UNIT – I:

Introduction and Classical Optimization Techniques: Statement of an Optimization problem - design vector - design constraints - constraint surface - objective function - objective function surfaces - classification of Optimization problems.

Classical Optimization Techniques: Single variable Optimization - multi variable Optimization without constraints - necessary and sufficient conditions for minimum/maximum - multivariable Optimization with equality constraints.

Solution by method of Lagrange multipliers - Multivariable Optimization with inequality constraints - Kuhn - Tucker conditions.

UNIT – II:

Linear Programming: Standard form of a linear programming problem - geometry of linear programming problems - definitions and theorems - solution of a system of linear simultaneous equations - pivotal reduction of a general system of equations - motivation to the simplex method - simplex algorithm.

Transportation Problem: Finding initial basic feasible solution by north - west corner rule, least cost method and Vogel's approximation method - testing for optimality of balanced transportation problems.

UNIT – III:

Unconstrained Nonlinear Programming: One dimensional minimization methods, Classification, Fibonacci method and Quadratic interpolation method

Unconstrained Optimization Techniques: Univariant method, Powell's method and steepest descent method.

UNIT – IV:

Constrained Nonlinear Programming: Characteristics of a constrained problem - classification - Basic approach of Penalty Function method - Basic approach of Penalty Function method - Basic approaches of Interior and Exterior penalty function methods - Introduction to convex programming problem.

UNIT – V:

Dynamic Programming: Dynamic programming multistage decision processes - types - concept of sub optimization and the principle of optimality - computational procedure in dynamic programming - examples illustrating the calculus method of solution - examples illustrating the tabular method of solution.

TEXT BOOKS

1. Singiresu S. Rao, Engineering Optimization: Theory and Practice by John Wiley and Sons, 4th edition, 2009.
2. H. S. Kasene &K. D. Kumar, Introductory Operations Research, Springer (India), Pvt. Ltd., 2004.

REFERENCE BOOKS

1. George Bernard Dantzig, Mukund Narain Thapa, "Linear programming", Springer series in operations research 3rd edition, 2003.
2. H.A. Taha, "Operations Research: An Introduction", 8th Edition, Pearson/Prentice Hall, 2007.
3. Kalyanmoy Deb, "Optimization for Engineering Design - Algorithms and Examples", PHI Learning Pvt. Ltd, New Delhi, 2005.

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ELECTRONICS AND COMMUNICATION ENGINEERING-R17

EMBEDDED SYSTEMS DESIGN – A48PEI-II

B.Tech IV Year II Semester **L/T/P/ C**

3/0/0/ 3

COURSE OBJECTIVES:

1. To provide an overview of Design Principles of Embedded System.
2. To provide clear understanding about the role of firmware, operating systems in correlation with hardware systems.

COURSE OUTCOMES:

1. Expected to understand the selection procedure of Processors in the embedded domain.
2. Design Procedure for Embedded Firmware.
3. Expected to visualize the role of Real time Operating Systems in Embedded Systems.
4. Expected to evaluate the Correlation between task synchronization and latency issues

UNIT – I:

Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

UNIT – II:

Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS).

Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

UNIT – III:

Trends in Embedded Industry: Processor Trends in Embedded Systems, Embedded OS Trends, Development Language Trends, Open Standards, Frameworks & Alliances, Bottlenecks, Development Platform Trends, Cloud, Internet Of Things (IoT) & Embedded Systems.

Communication Interface: Onboard and External Communication Interfaces.

UNIT –IV:

RTOS Based Embedded System Design: Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

UNIT – V:

Task Communication: Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

TEXT BOOKS

1. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill.

REFERENCE BOOKS

1. Embedded Systems - Raj Kamal, Mc Graw Hill Education.
2. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
3. Embedded Systems - Lyla, Pearson, 2013
4. An Embedded Software Primer - David E. Simon, Pearson Education.

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SATELLITE COMMUNICATIONS – A48PEI-III

B.Tech IV Year II Semester **L/T/P/ C**
3/0/0/ 3

Course Objectives:
The course objectives are:

1. To prepare students to excel in basic knowledge of satellite communication principles
2. To provide students with solid foundation in orbital mechanics and launches for the satellite communication
3. To train the students with a basic knowledge of link design of satellite with a design examples.
4. To provide better understanding of multiple access systems and earth station technology
5. To prepare students with knowledge in satellite navigation and GPS & and satellite packet communications.

Course Outcomes:
At the end of the course, Students will be able to

1. Understand the historical background, basic concepts and frequency allocations for satellite communication
2. Demonstrate orbital mechanics, launch vehicles and launchers
3. Demonstrate the design of satellite links for specified C/N with system design examples.
4. Visualize satellite sub systems like Telemetry, tracking, command and monitoring power systems etc.
5. Understand the various multiple access systems for satellite communication systems and satellite packet communications.

UNIT – I:
Introduction: Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency Allocations for Satellite Services, Applications, Future Trends of Satellite Communications, Advantages of Satellite Communications,.
Orbital Mechanics and Launchers: Orbital Mechanics, Orbital Period and Velocity, Look Angle determination, Orbital Perturbations, Orbit determination, Launches and Launch vehicles, Orbital Effects in Communication Systems Performance, Orbital Elements.

UNIT – II:
Satellite Subsystems: Attitude and Orbit Control System, Telemetry, Tracking, Command and Monitoring, Power Systems, Communication Subsystems, Satellite Antennas, Equipment Reliability and Space Qualification.

UNIT – III:

Satellite Link Design: Basic Transmission Theory, System Noise Temperature and G/T Ratio, Design of Down Links, Up Link Design, Design Of Satellite Links For Specified C/N, System Design Examples.

Multiple Access: Frequency Division Multiple Access (FDMA), Intermodulation, Calculation of C/N, Time Division Multiple Access (TDMA), Frame Structure, Examples, Satellite Switched TDMA Onboard Processing, DAMA, Code Division Multiple Access (CDMA), Spread Spectrum Transmission and Reception.

UNIT – IV:

Earth Station Technology: Introduction, Transmitters, Receivers, Antennas, Tracking Systems, Terrestrial Interface, Primary Power Test Methods.

UNIT – V:

Low Earth Orbit and Geo-Stationary Satellite Systems: Orbit Considerations, Coverage and Frequency Consideration, Delay & Throughput Considerations, System Considerations, Operational NGSO Constellation Designs.

Satellite Navigation & Global Positioning System : Radio and Satellite Navigation, GPS Position Location Principles, GPS Receivers and Codes, Satellite Signal Acquisition, GPS Navigation Message, GPS Signal Levels, GPS Receiver Operation, GPS C/A Code Accuracy, Differential GPS.

TEXTBOOKS

1. Satellite Communications - Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition, 2003.
2. Satellite Communications Engineering - Wilbur L. Pritchard, Robert A Nelson and Henri G.Suyderhoud, 2nd Edition, Pearson Publications, 2003.

REFERENCE BOOKS

1. Satellite Communications: Design Principles - M. Richharia, BS Publications, 2nd Edition, 2003.
2. Satellite Communication - D.C Agarwal, Khanna Publications, 5th Edition.
3. Fundamentals of Satellite Communications - K.N. Raja Rao, PHI, 2004 Satellite Communications - Dennis Roddy, McGraw Hill, 4th Edition, 2009.

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OPTICAL COMMUNICATIONS – A28PE2-I

B.Tech IV Year II Semester **L/T/P/ C**
3/0/0/ 3

COURSE OBJECTIVES:

The objectives of the course are:

1. To realize the significance of optical fibre communications.
2. To understand the construction and characteristics of optical fibre cable.
3. To develop the knowledge of optical signal sources and power launching.
4. To identify and understand the operation of various optical detectors.
5. To understand the design of optical systems and WDM.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

1. Understand and analyze the constructional parameters of optical fibres.
2. Be able to design an optical system.
3. Estimate the losses due to attenuation, absorption, scattering and bending.
4. Compare various optical detectors and choose suitable one for different applications.

UNIT – I:

Overview of Optical Fiber Communication: Historical development, The general system, Advantages of Optical Fiber Communications, Optical Fiber Wave Guides- Introduction, Ray Theory Transmission, Total Internal Reflection, Acceptance Angle, Numerical Aperture, Skew Rays, Cylindrical Fibers- Modes, V number, Mode Coupling, Step Index Fibers, Graded Index Fibers.

Single Mode Fibers: Cut-off Wavelength, Mode Field Diameter, Effective Refractive Index, Fiber Materials Glass, Halide, Active Glass, Chalgenide Glass, Plastic Optical Fibers.

UNIT – II:

Signal Distortion in Optical Fibers: Attenuation, Absorption, Scattering and Bending Losses, Core and Cladding Losses, Information Capacity Determination, Group Delay, Types of Dispersion - Material Dispersion, Wave-Guide Dispersion, Polarization Mode Dispersion, Intermodal Dispersion, Pulse Broadening, Optical Fiber Connectors- Connector Types, Single Mode Fiber Connectors, Connector Return Loss.

UNIT – III:

Fiber Splicing: Splicing Techniques, Splicing Single Mode Fibers, Fiber Alignment and Joint Loss-Multimode Fiber Joints, Single Mode Fiber Joints.

Optical Sources: LEDs, Structures, Materials, Quantum Efficiency, Power, Modulation, Power

Bandwidth Product, Injection Laser Diodes Modes, Threshold Conditions, External Quantum Efficiency, Laser Diode Rate Equations, Resonant Frequencies, Reliability of LED & ILD.

Source to Fiber Power Launching: Output Patterns, Power Coupling, Power Launching, Equilibrium Numerical Aperture, Laser Diode to Fiber Coupling.

UNIT – IV:

Optical Detectors: Physical Principles of PIN and APD, Detector Response Time, Temperature Effect on Avalanche Gain, Comparison of Photo Detectors, Optical Receiver Operation, Fundamental Receiver Operation, Digital Signal Transmission, Error Sources, Receiver Configuration, Digital Receiver Performance, Probability of Error, Quantum Limit, Analog Receivers.

UNIT – V:

Optical System Design: Considerations, Component Choice, Multiplexing, Point-to- Point Links, System Considerations, Link Power Budget with Examples, Overall Fiber Dispersion in Multi-Mode and Single Mode Fibers, Rise Time Budget with Examples.
Transmission Distance, Line Coding in Optical Links, WDM, Necessity, Principles, Types of WDM, Measurement of Attenuation and Dispersion, Eye Pattern.

TEXT BOOKS

1. Optical Fiber Communications - Gerd Keiser, MC GRAW HILL EDUCATION, 4th Edition, 2008.
2. Optical Fiber Communications - John M. Senior, Pearson Education, 3rd Edition, 2009.

REFERENCE BOOKS

1. Fiber Optic Communications - D.K. Mynbaev, S.C. Gupta and Lowell L. Scheiner, Pearson Education, 2005.
2. Text Book on Optical Fibre Communication and its Applications - S.C.Gupta, PHI, 2005.
3. Fiber Optic Communication Systems - Govind P. Agarwal, John Wiley, 3rd Edition, 2004.
4. Introduction to Fiber Optics by Donald J.Sterling Jr. - Cengage learning, 2004.

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WIRELESS COMMUNICATIONS AND NETWORKS – A48PE2-II

B. Tech IV Year II Semester **L/T/P/ C**
3/0/0/ 3

Course objectives:
The course objectives are:

1. To provide the students with the fundamental treatment about many practical and theoretical concepts that forms basic of wireless communications.
2. To prepare students to understand the concept of frequency reuse, and be able to apply it in the design of mobile cellular system.
3. To prepare students to understand various modulation schemes and multiple access techniques that are used in wireless communications,
4. To train students to understand the architecture and operation of various wireless wide area networks such as GSM, IS-95, GPRS and SMS.
5. To train students to understand wireless LAN architectures and operation.
6. To prepare students to understand the emerging technique OFDM and its importance in the wireless communications.

Course Outcomes:
Upon completion of the course, the student will be able to:

1. Understand the principles of wireless communications.
2. Understand fundamentals of wireless networking
3. Understand cellular system design concepts.
4. Analyze various multiple access schemes used in wireless communication.
5. Understand wireless wide area networks and their performance analysis.
6. Demonstrate wireless local area networks and their specifications.
7. Familiar with some of the existing and emerging wireless standards.
8. Understand the concept of orthogonal frequency division multiplexing.

UNIT – I:
The Cellular Concept-System Design Fundamentals: Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies- Prioritizing Handoffs, Practical Handoff Considerations, Interference and system capacity - Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference , Power Control for Reducing interference, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring.

UNIT – II:
Mobile Radio Propagation: Large-Scale Path Loss: Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, The Three Basic Propagation

Mechanisms, Reflection-Reflection from Dielectrics, Brewster Angle, Reflection from prefect conductors, Ground Reflection (Two- Ray) Model, Diffraction-Fresnel Zone Geometry, Knife-edge Diffraction Model, Multiple knife-edge Diffraction, Scattering, Outdoor Propagation Models-Longley-Ryce Model, Okumura Model, Hata Model, PCS Extension to Hata Model, Walfisch and Bertoni Model, Wideband PCS Microcell Model, Indoor Propagation Models-Partition losses (Same Floor), Partition losses between Floors, Log-distance path loss model, Ericsson Multiple Breakpoint Model, Attenuation Factor Model, Signal penetration into buildings, Ray Tracing and Site Specific Modeling.

UNIT – III:

Mobile Radio Propagation: Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel- Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath Fading Channels-Clarke's model for flat fading, spectral shape due to Doppler spread in Clarke's model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.

UNIT – IV:

Equalization and Diversity: Introduction, Fundamentals of Equalization, Training A Generic Adaptive Equalizer, Equalizers in a communication Receiver, Linear Equalizers, Non linear Equalization- Decision Feedback Equalization (DFE), Maximum Likelihood Sequence Estimation (MLSE) Equalizer, Algorithms for adaptive equalization-Zero Forcing Algorithm, Least Mean Square Algorithm, Recursive least squares algorithm. Diversity Techniques-Derivation of selection Diversity improvement, Derivation of Maximal Ratio Combining improvement, Practical Space Diversity Consideration-Selection Diversity, Feedback or Scanning Diversity, Maximal Ratio Combining, Equal Gain Combining, Polarization Diversity, Frequency Diversity, Time Diversity, RAKE Receiver.

UNIT – V:

Wireless Networks: Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11,IEEE 802.11 Medium Access Control, Comparison of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, HiperLan, WLL.

TEXT BOOKS

1. Wireless Communications, Principles, Practice - Theodore, S. Rappaport, 2nd Ed., 2002, PHI.
2. Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press.
3. Principles of Wireless Networks - Kaveh Pah Laven and P. Krishna Murthy, 2002, PE

REFERENCEBOOKS

1. Wireless Communication and Networking - William Stallings, 2003, PHI.

TKR COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous)
ELECTRONICS AND COMMUNICATION ENGINEERING-R17

PRINCIPLES OF ELECTRONIC COMMUNICATIONS – A48PE2-III

B. Tech IV Year II Semester **L/T/P/ C**
3/0/0/ 3

COURSE OBJECTIVES:

The objective of this subject is to

1. Introduce the students to modulation and various analog and digital modulation schemes.
2. They can have a broad understanding of satellite, optical, cellular, mobile, wireless and telecom concepts.

COURSE OUTCOMES:

By completing this subject, the student can

1. Work on various types of modulations.
2. Should be able to use these communication modules in implementation.
3. Will have a basic understanding of various wireless and cellular, mobile and telephone communication systems.

UNIT – I:

Introduction: Need for Modulation, Frequency translation, Electromagnetic spectrum, Gain, Attenuation and decibels.

UNIT – II:

Simple description on Modulation: Analog Modulation-AM, FM, Pulse Modulation-PAM, PWM, PCM, Digital Modulation Techniques-ASK, FSK, PSK, QPSK modulation and demodulation schemes.

UNIT – III:

Telecommunication Systems: Telephones Telephone system, Paging systems, Internet Telephony.
Networking and Local Area Networks: Network fundamentals, LAN hardware, Ethernet LANs, Token Ring LAN.

UNIT – IV:

Satellite Communication: Satellite Orbits, satellite communication systems, satellite subsystems, Ground Stations Satellite Applications, Global Positioning systems.
Optical Communication: Optical Principles, Optical Communication Systems, Fiber Optic Cables, Optical Transmitters & Receivers, Wavelength Division Multiplexing.

UNIT – V:

Cellular and Mobile Communications: Cellular telephone systems, AMPS, GSM, CDMA and WCDMA.
Wireless Technologies: Wireless LAN, PANs and Bluetooth, ZigBee and Mesh Wireless networks, Wimax and MANs, Infrared wireless, RFID communication, UWB.

TEXT BOOKS

1. Principles of Electronic Communication Systems, Louis E. Frenzel, 3e, McGraw Hill Publications, 2008.
2. Electronic Communications systems, Kennedy, Davis 4e, McGraw Hill Education, 1999

REFERENCE BOOKS

1. Theodore Rappaport, Wireless Communications-Principles and practice, Prentice Hall, 2002.
2. Roger L. Freeman, Fundamentals of Telecommunications, 2e, Wiley publications.
3. Introduction to data communications and networking, Wayne Tomasi, Pearson Education, 2005.