218BSE08	PHYSICS FOR ELECTRONICS ENGINEERING	L T P C
		2 0 0 2

COURSE OBJECTIVES:

- To study the basic theory of structure of crystalline materials.
- To understand the essential principles of electrical properties of materials.
- To get the better knowledge of Physics of semiconductor materials.
- Become proficient in dielectric properties of materials.
- To understand the essential concepts of nanomaterial devices and applications

UNIT I CRYSTALLOGRAPHY

Crystal structures- Parameters- Bravais lattice - Calculation of number of atoms per unit cell - Atomic radius - Coordination number - Packing factor for SC, BCC, FCC, HCP and Diamond cubic structure - NaCl, ZnS structures (qualitative). Miller indices- unit cell approach.

UNIT II ELECTRICAL PROPERTIES OF MATERIALS

Classical free electron theory-Expression for electrical conductivity-Thermal conductivity, Expression-Wiedemann-Franz law-Success and failures-Quantum free electron theory-Particle in a finite potential well-Tunneling-Particle in a three dimensional box-degenerate States-FermiDirac statistics-Density of energy states-Energy bands in solids.

UNIT III SEMICONDUCTORS AND TRANSPORT PHYSICS

Intrinsic Semiconductors-Energy band diagram-direct and indirect band gap semiconductors - Carrier concentration in intrinsic semiconductors-extrinsic semiconductors-Carrier concentration in N-type & P-type semiconductors (qualitative) -Variation of carrier concentration with temperature -Hall effect and devices-Ohmic contacts-Schottky diode.

UNIT IV DIELECTRIC MATERIALS

Dielectrics: Dielectric constant - Dielectric loss - Electrical susceptibility- Electronic, ionic - orientational and space charge polarization - Frequency and temperature dependence of polarization - internal field - Claussius - Mosotti relation (derivation) - Thermal conductivity by Lee's disc method for dielectric material.

UNIT V NANOMATERIAL DEVICES

Nano materials: Introduction – Synthesis – Plasma arcing – Chemical vapour deposition – Electro deposition – Ball Milling – Sol-Gel method – Spin coating method- photo current in a P-N diode - Solar cell – LED- Properties of nanoparticles and their applications.

COURSE OUTCOMES:

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

CO1: Have the necessary understanding on the functioning of crystalline in solids of materials.

CO2: Gain knowledge on classical and quantum electron theories, and energy band structures.

CO3: Acquire knowledge on basics of semiconductor physics and its applications in various devices.

CO4: Get knowledge on dielectric properties of materials and their applications.

CO5: Understand the basics of nanodevices and applications.

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TEXT/REFERENCE BOOKS:

1. Donald Askeland, "Materials Science and Engineering", Cengage Learning India Pvt Ltd., 2010.
2. Kasap S.O., "Principles of Electronic Materials and Devices" Tata Mc Graw-Hill 2007.
3. Pierret R.F, "Semiconductor Device Fundamentals", Pearson 2006
4. W.D.Callister and D.G.Rethwisch, "Materials Science and Engineering", John Wiley & Sons,Inc., New Jersey (2010).
5. Hanson G.W., "Fundamentals of Nanoelectronics", Pearson Education 2009.

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318MAT01	ENGINEERING MATHEMATICS – III	L T P C 3 1 0 4

COURSE OBJECTIVES

- Revise the concept of integral calculus and introduce Beta and Gamma functions.
- Understand double and triple integration concepts and apply to study vector calculus comprising of surface and volume integrals along with the classical theorems involving them.
- Learn analytic functions and their properties and also conformal mappings with few standard examples those have direct applications.
- Grasp the basics of complex integration and application to contour integration which is important for evaluation of certain integrals encountered in engineering problems.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS **9+3**

Solutions of first order partial differential equations-Standard types-Singular solutions-Lagrange's Linear equation- Method of grouping and Method of multipliers-Solution of homogeneous and non-homogenous linear equations of second and higher order with constant coefficients

UNIT II FOURIER SERIES **9+3**

Dirichlet's conditions – General Fourier series – Change of scale - Odd and even functions – Half-range Sine and Cosine series – Parseval's identity applications – Harmonic Analysis

UNIT III BOUNDARY VALUE PROBLEMS **9+3**

Classification of Partial Differential Equations – Method of separation of Variables – Solutions of one dimensional wave equations and One-dimensional heat equations –Applications using Fourier series solutions in Cartesian coordinates - Steady state solution of two-dimensional heat equation.

UNIT IV FOURIER TRANSFORM **9+3**

Fourier integral theorem – Fourier transform pair - Sine and Cosine transforms – Properties – Fourier Transform of simple functions – Convolution theorem (statement and applications only) – Parseval's identity (statement and applications only).

UNIT V Z – TRANSFORM **9+3**

Z-Transform - Elementary properties and applications – Initial and final value theorems (Statement and applications only) - Inverse Z-Transform – Partial fractions method, Residue theorem method and Convolution theorem (statement and applications only) - Solution of difference equations by applying Z-transforms

TOTAL HOURS:60 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1: Know the methods to solve partial differential equations occurring in various physical and engineering problems.

CO2: Describe an oscillating function which appear in a variety of physical problems by Fourier series helps them to understand its basic nature deeply.

CO3: Acquire the knowledge to construct partial differential equations with initial and boundary conditions for various physical and engineering real time problems and obtaining solution using Fourier series methods.

CO4: Understand the effect of Fourier transform techniques and their applications.

CO5: Gain the concept of analysis of linear discrete system using z-transform approach

TEXT BOOKS

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publications, 43rd edition, 2015.

REFERENCE BOOKS

1. Andrews L.C and Shivamoggi. B.K., "Integral Transforms for Engineers", SPIE Press Book, 1999
2. Wylie C R and Barrett L C, "Advanced Engineering Mathematics", 6th Edition, McGraw-Hill Co., New Delhi, 1995.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition Wiley India, 2016.
4. V.Prameelakaladharan and G.Balaji ,"Engineering Mathematics-III", Amrutha marketing, Chennai,2016
5. T.Veerarajan,"Engineering Mathematics-III", Tata McGraw-Hill Publishing company, New Delhi,2015.
6. P.Kandasamy, K.Thilagavathy, K.Gunavathy, " Engineering Mathematics-III", S.Chand Publishers,2015.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
Co1	Know the methods to solve partial differential equations occurring in various physical and engineering problems.	3	2	1									1	3	1	
Co2	Describe an oscillatingfunction which appear in a variety of physical problems by Fourier series helps them to understand its basic nature deeply.	3	2	1									1	3	1	
Co3	Acquire the knowledge to construct partial differential equations with initial and boundary conditions for various physical and engineering real time problems and obtaining solution using Fourier series methods.	3	2	1									1	3	1	
Co4	Understand the effect of Fourier transform techniques and their applications.	3	2	3	1	3							1	3	1	
Co5	Gain the concept of analysisof linear discrete system usingz-transform approach	3	2	3	1	3							1	3	1	

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318ECT02	SIGNALS AND SYSTEMS	L T P C 3 0 0 3

COURSE OBJECTIVES:

- Demonstrate an understanding of the fundamental properties and representation of discrete and continuous time signals.
- Do Spectral analysis of CT periodic and aperiodic signals using CT Fourier and Laplace methods.
- Analyse and Characterization of total response, impulse response and frequency response of LTI CT systems.
- Use Discrete Time Fourier Transforms and Z transform to analyze discrete time signals.
- Analyse and Characterization of total response, impulse response and frequency response of LTI DT systems.

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS 9

Continuous Time signals (CT signals), Discrete Time signals (DT signals) - Step, Ramp, Impulse, Exponential, Classification of CT and DT signals - periodic and aperiodic, Energy and power, even and odd, Deterministic and Random signals, Transformation on Independent variables -CT systems and DT systems, Properties of Systems – Linearity, Causality, Time Invariance, Stability, Invertibility and LTI Systems.

UNIT II ANALYSIS OF CT SIGNALS 9

Fourier Series for periodic signals-Fourier transform-properties-Laplace transforms and properties

UNIT III LTI-CT SYSTEMS 9

Differential equations-Total Response- Fourier Transform & Laplace Transform, Impulse response, Convolution Integral, Frequency response.

UNIT IV ANALYSIS OF DT SIGNALS 9

Spectrum of DT Signals, Discrete Time Fourier Transform (DTFT), Z-Transform in signal analysis, Z-transform-Properties-ROC and Inverse Z Transform-Partial Fraction-Long Division.

UNIT V LTI-DT SYSTEMS 9

Difference equations, Total Response-Z- Transform, Impulse response, Convolution sum, Frequency response

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1: Categorize the properties and representation of discrete and continuous time signals.
CO2: Analyze the continuous time signal using Fourier and Laplace transform.
CO3: Determine total response, impulse response and frequency response of LTI-CT systems
CO4: Analyze the discrete time signals using Discrete Time Fourier Transforms and Z transform
CO5: Determine total response, impulse response and frequency response of LTI-DT systems

TEXT BOOKS:

1. AlanV.Oppenheim, Alan S.Willsky with S.Hamid Nawab, Signals & Systems, 2nd edn., Pearson Education, 2015
2. M.J.Roberts, Signals and Systems Analysis using Transform method and MATLAB, TMH 2003.

REFERENCE BOOKS:

1. Lathi.B.P,Signals Systems and Communication, B S Publications, Hyderabad, 2001.
2. Simon Haykin and Barry Van Veen, Signals and Systems, John Wiley, 1999
3. K.Lindner, "Signals and Systems", McGraw Hill International, 1999
4. Michael J Roberts, "Fundamentals of Signals and syste ms" Tata McGraw Hill, 2007

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Categorize the properties and representation of discrete and continuous time signals.	3	2	1									1	3	1	
Co2	Analyze the continuous time signal using Fourier and Laplace transform.	3	2	3	1	3							1	3	1	
Co3	Determine total response, impulse response and frequency response of LTI-CT systems	3	2	1									1	3	1	
Co4	Analyze the discrete time signals using Discrete Time Fourier Transforms and Z transform	3	2	3	1	3							1	3	1	
Co5	Determine total response, impulse response and frequency response of LTI-DT systems									1	3	1	2	1		3

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318ECT03	FUNDAMENTALS OF DATASTRUCTURES IN C	L T P C 3 0 0 3

COURSE OBJECTIVES

- Familiarize the basic programming concepts in C.
- Solve real time problems using functions, structure and union.
- Impart the basic concepts of linear data structures.
- Solve problem using nonlinear data structures
- Identity the various Sorting, Searching and hashing algorithms.

UNIT I FUNDAMENTALS OF DATASTRUCTURES IN C **9**

Structure of a C program - compilation and linking processes - Constants, Variables – DataTypes - Expressions using operators in C - Managing Input and Output operations - Decision Making and Branching - Looping statements. Arrays - Initialization - Declaration - One dimensional and Two-dimensional arrays. Strings - String operations - String Arrays.

UNIT II FUNCTIONS, POINTERS, STRUCTURESANDUNIONS **9**

Functions - Pass by value - Pass by reference - Recursion - Pointers - Initialization - Pointers arithmetic. Structures and unions - Structure within a structure - Union - **Files- Operations on Files- Memory Management.**

UNIT III LINEAR DATA STRUCTURES **9**

Abstract Data Types - Linked list Implementation of List- polynomial addition- Linked List Implementation of Stack-Balancing Symbols - Postfix Expressions - Infix to Postfix Conversion - Linked list Implementation of Queues- Circular Queue.

UNIT IV NON LINEAR DATA STRUCTURES **9**

Preliminaries -Binary Trees -Tree Traversals - Binary Search Tree -Operations on Binary Search Tree - Heaps – Binary Heaps - Operations of Heaps - Graph and its representations -**Graph Traversals** -Shortest Path Algorithm: Dijkstra's Algorithm- Minimum Spanning Tree:Prim's Algorithm – Kruskal's Algorithm.

UNIT V SEARCHING, SORTING AND HASHING **9**

Linear Search - Binary Search -Bubble Sort - Insertion Sort - Quick Sort - Merge Sort - Hash Functions - Separate Chaining -Open Addressing.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to:

CO1: Summarize the basic concepts of C
CO2: Develop programs for real time application using functions, structures, union
CO3: Gain knowledge on operations of linear data structures
CO4: Develop applications using nonlinear data structures
CO5: Apply appropriate sorting, searching technique for given problem.

TEXT BOOKS

1. Ashok.N.Kamthane,- "Computer Programming" , Pearson Education,Second edition(India), 2012
2. Mark Allen Weiss, "Data Structures And Algorithm Analysis In C", Second Edition, Pearson Education,

REFERENCE BOOKS

1. PradipDey and ManasGhosh, —Programming in C, Second Edition,Oxford University Press, 2011.
2. E.Balagurusamy, - "Computing fundamentals and C Programming", Tata McGraw-HillPublishing Company Limited, 2008.
3. Ellis Horowitz, SartajSahni, Susan Anderson-Freed, —Fundamentals of Data Structures in C, Second Edition, University Press, 2008

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
Co1	Summarize the basic conceptsof C	3	3		2								1	3	1	
Co2	Develop programs for real time application using functions, structures, union	2	3		1	2							1	3	1	
Co3	Gain knowledge on operationsof linear data structures	2	3		1	2							1	3	1	
Co4	Develop applications using nonlinear data structures	3	2		3	2							1	2	3	
Co5	Apply appropriate sorting, searching technique for given problem.	2	3		1	2							1		3	

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318ECT04	ANALOG ELECTRONICS-I	L T P C 3 0 0 3

COURSE OBJECTIVES

- Understand DC loadline and various biasing technique and compensation technique for transistors
- Analyze small signal and large signal model for BJT
- Analyze small signal model for JFET
- Analyze high and low frequency model of BJT and MOSFET
- Define Rectifiers and power supplies concepts

UNIT I BIASING OF DISCRETE BJT 9

D C Load line, Operating Point, Various biasing methods for BJT-Fixed bias-Voltage divider bias or Potential Divider-Collector to Base bias-Emitter Bias- Design – Stability – Bias Compensation-Diode Compensation for Instability-Thermistor Compensation- Thermal Stability.

UNIT II BJT AMPLIFIERS 9

Small signal Analysis of Common Emitter Amplifier using $r_e$model-AC Load line, Voltage swing limitations, Common collector and common base amplifiers using $r_e$model – Differential amplifiers-CMRR- Darlington Amplifier –Bootstrap technique Cascaded stages - Cascode Amplifier.

UNIT III JFET AND MOSFET AMPLIFIERS 9

Small Signal Hybrid π equivalent circuit of FET and MOSFET – Analysis of CS, CD and CG amplifiers using Hybrid π equivalent circuits – Basic FET differential pair- BiCMOS circuits.Cascode amplifier.

UNIT IV FREQUENCY ANALYSIS OF BJT AND MOSFET AMPLIFIERS 9

Low frequency and Miller effect, High frequency analysis of CE and MOSFET CS amplifier, Short circuit current gain, cut off frequency – fα and fβ unity gain and Determination of bandwidth of single stage and multistage amplifiers.

UNIT V RECTIFIERS AND POWER SUPPLIES 9

Half wave and Full wave Rectifiers - Ripple factor, Regulation, Rectification efficiency, TUF - Filters - L, C and Pi type filters - Ripple factor and regulation - Voltage Regulators - Series and Shunt Voltage Regulators.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to:

CO1:Recognize various biasing technique and compensation technique for transistors
CO2:Design small signal and large signal amplifiers using BJT for various application
CO3:Design small signal amplifiers using FET and MOSFET
CO4:Design high and low frequency amplifiers and to calculate Bandwidth
CO5:Design Rectifiers and power supplies for various applications

TEXT BOOKS

1. Millman J and Halkias .C., Integrated Electronics, TMH, 2007.
2. Salivahanan, N. Suresh Kumar and A. Vallavaraj, Electronic Devices and Circuits, 2nd Edition, TMH, 2007
3. Donald .A. Neamen, Electronic Circuit Analysis and Design –2nd Edition,TataMcGraw Hill, 2009.

REFERENCE BOOKS

1. Robert L. Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory, 9th Edition, Pearson Education / PHI, 2007
2. David A. Bell, Electronic Devices & Circuits, 4th Ediion, PHI, 2007
3. Floyd, Electronic Devices, Sixth Edition, Pearson Education, 2002.
4. I.J. Nagrath, Electronic Devices and Circuits, PHI, 2007.
5. Anwar A. Khan and Kanchan K. Dey, A First Course on Electronics, PHI, 2006.
6. B.P. Singh andRekha Singh, Electronic Devices and Integrated Circuits, Pearson Education, 2006.
7. Rashid M, Microelectronics Circuits, Thomson Learning, 2007.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Recognize various biasing technique and compensation technique for transistors	3	2		3	2				1			1		3	
Co2	Design small signal and large signal amplifiers using BJT for various application	3	2		1	2							1	3	1	
Co3	Design small signal amplifiers using FET and MOSFET	3	2		1	2							1	2	1	
Co4	Recognize various biasing technique and compensation technique for transistors	3	2		3	2				1			1		3	
Co5	Design small signal and large signal amplifiers using BJT for various application	3	2		1	2							1	3	1	

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318ECT05	DIGITAL ELECTRONICS	L T P C 3 0 0 3

COURSE OBJECTIVES:

- Minimize the Boolean expression and identify the various operations of Logic gates
- Design and analyze of various combinational circuits
- Design various sequential circuits like counters, registers, etc
- Understand the concept of memories and programmable logic devices.
- Design and analyze synchronous and asynchronous sequential circuits

UNIT I MINIMIZATION TECHNIQUES AND LOGIC GATES 9

Minimization Techniques: Boolean postulates and laws – De-Morgan's Theorem -Principle of Duality - Boolean expression - Minimization of Boolean expressions — Minterm – Maxterm - Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization – Don't care conditions - Quine-McCluskey method of minimization.

Logic Gates: AND, OR, NOT, NAND, NOR, Exclusive–OR and Exclusive–NOR- Implementations of Logic Functions using gates, NAND–NOR implementations – Multi level gate implementations- Multi output gate implementations

UNIT II COMBINATIONAL CIRCUITS 9

Design procedure – Half adder – Full Adder – Half subtractor – Full subtractor - Parallel binary adder, parallel binary Subtractor – Fast Adder - Carry Look Ahead adder – Serial Adder/Subtractor - BCD adder – Binary Multiplier – Binary Divider - Multiplexer/ Demultiplexer – decoder - encoder – parity checker – parity generators - code converters - Magnitude Comparator

UNIT III SEQUENTIAL CIRCUITS 9

Latches, Flip-flops - SR, JK, D, T, and Master-Slave – Characteristic table and equation –Application table – Edge triggering – Level Triggering – Realization of one flip flop using other flip flops – serial adder/subtractor- Asynchronous Ripple or serial counter –Asynchronous Up/Down counter - Synchronous counters – Synchronous Up/Down counters – Programmable counters – Design of Synchronous counters: state diagram- State table –State minimization –State assignment - Excitation table and maps-Circuit implementation - Modulo–n counter, Registers – shift registers - Universal shift registers– Shift register counters – Ring counter – Shift counters - Sequence generators.

UNIT IV SYNCHRONOUS AND AYNCHRONOUS SEQUENTIAL CIRCUITS 9

Synchronous Sequential Circuits: General Model – Classification – Design – Use of Algorithmic State Machine – Analysis of Synchronous Sequential Circuits

Asynchronous Sequential Circuits: Design of fundamental mode and pulse mode circuits – Incompletely specified State Machines – Problems in Asynchronous Circuits – Design of hazard Free Switching circuits..

UNIT V MEMORY DEVICES 9

Classification of memories – ROM - ROM organization - PROM – EPROM – EEPROM – EAPROM, RAM – RAM organization – Write operation – Read operation – Memory cycle - Timing wave forms – Memory decoding – memory expansion – Static RAM Cell-Bipolar RAM cell – MOSFET RAM cell – Dynamic RAM cell – Implementation of combinational logic circuits using ROM, Introduction to Flash Memory.

TOTAL HOURS:45 PERIODS

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COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1:Solve and implement various Boolean expression with minimized logic gates
CO2:Implement the various combinational circuits for real time applications
CO3:Design and analyze various sequential circuits like counters, registers, etc
CO4:Demonstrate the concept of memories and programmable logic devices.
CO5:Implement synchronous and asynchronous sequential circuits

TEXT BOOKS

1. M. Morris Mano, Digital Design, 3rd Edition, Prentice Hall of India Pvt. **Ltd.**, 2003 / Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.
2. S. Salivahanan and S. Arivazhagan, Digital Circuits and Design, 3rd Edition., Vikas Publishing House Pvt. Ltd, New Delhi, 2006

REFERENCE BOOKS

1. John F.Wakerly, Digital Design, Fourth Edition, Pearson/PHI, 2006
2. John.M Yarbrough, Digital Logic Applications and Design, Thomson Learning, 2002.
3. Charles H.Roth. Fundamentals of Logic Design, Thomson Learning, 2003.
4. Donald P.Leach and Albert Paul Malvino, Digital Principles and Applications, 6thEdition, TMH, 2003.
5. William H. Gothmann, Digital Electronics, 2nd Edition, PHI, 1982.
6. Thomas L. Floyd, Digital Fundamentals, 8th Edition, Pearson Education Inc, New Delhi, 2003.
7. Donald D.Givone, Digital Principles and Design, TMH, 2003

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Solve and implement various Boolean expression with minimized logic gates									1	3	1	2		1	2
Co2	Implement the various combinational circuits for real time applications	3	3		2	3							1	3	1	
Co3	Design and analyze various sequential circuits like counters, registers, etc	1			1		3	3	2						1	3
Co4	Demonstrate the concept of memories and programmable logic devices.	2	3	1		2	1	1						2	1	
Co5	Implement synchronous and asynchronous sequential circuits	3	2	3	1	1		1					1	3	1	

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318ECP07 FUNDAMENTALS OF DATA STRUCTURES IN C LABORATORY **L T P C**
0 0 2 1

COURSE OBJECTIVES

- Understand and implement basic data structures using C
- Apply linear and non-linear data structures in problem solving
- Learn to implement functions and recursive functions by means of datastructures
- Implement searching and sorting algorithms.

LIST OF EXPERIMENTS

1. Basic C Programs – Looping, Decision- Making
2. Programming using Arrays and String functions
3. Programming using Functions and Recursion
4. Programs using Structures and Union
5. Program using Pointers
6. Program using Memory Management Functions
7. Linked list implementation of List ,Stacks and Queues
8. Implementation of Tree Traversals
9. Implementation of Binary Search trees
10. Implementation of Graph Traversals
11. Implementation of Shortest Path Algorithm
12. Implementation of Linear search and binary search
13. Implementation of Insertion sort, Quick sort and Merge Sort

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Implement basic and advanced programs in C
CO2: Implement functions and recursive functions in C
CO3: Apply the different Linear Data Structures for Implementing Solutions toPractical Problems.
CO4: Apply and implement Graph Data Structures for Real Time Applications.
CO5: Implement various Searching, Sorting and hashing Algorithms.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
Co1	Implement basic and advancedprograms in C	2	3		1	2							1	3	1	
Co2	Implement functions and recursive functions in C	2	3		1	2							1	3	1	
Co3	Apply the different Linear Data Structures for Implementing Solutions to Practical Problems.	3	3		2	3							1	3	1	

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Co4	Apply and implement Graph Data Structures for Real Time Applications.	3	2	3	1	1		1					1	3	1	
Co5	Implement various Searching, Sorting and hashingAlgorithms.	3	2		2	3							1	3	1	

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318ECP08 **ANALOG ELECTRONICS – I LABORATORY** L T P C
0 0 2 1

COURSE OBJECTIVES

- Analyze the different parameters of power supply circuits.
- Design amplifier circuit for various biasing technique
- Design Darlington amplifiers
- Design differential amplifiers
- Design of Power amplifiers

LIST OF EXPERIMENTS

1. a).Power Supply circuit - Half wave rectifier with simple capacitor filter.

   b). Power Supply circuit - Full wave rectifier with simple capacitor filter.
2. Design of voltage regulator using BJT.
3. Fixed Bias amplifier circuit using BJT.
4. Design and construct BJT Common Emitter Amplifier using voltage divider bias.
5. Design and construct BJT Common Collector Amplifier using voltage divider bias.
6. Design and Construct Darlington Amplifier using BJT.
7. Source followers with Bootstrapped gate resistance.
8. Differential amplifier using BJT.
9. Design of Class A Power Amplifier.
10. Class B Complementary symmetry power amplifiers.

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Design power supply circuits for various application
CO2: Calculate the gain of the amplifier
CO3: Measure the Bandwidth of Darlington amplifiers
CO4: Measure the CMRR value for differential amplifiers
CO5: Calculate the gain of the power amplifier

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Design power supply circuits for various application	3	2	3	1	1		1					1	3	1	
Co2	Calculate the gain of the amplifier	3	2	3	1	1		1					1	3	1	
Co3	Measure the Bandwidth of Darlington amplifiers	3	2	3	1	1		1					1	3	1	
Co4	Measure the CMRR value for differential amplifiers	3	2		2	3				1			1		2	
Co5	Calculate the gain of the power amplifier	3	2	3	1	1		1					1		2	

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318ECP09 **DIGITAL ELECTRONICS LABORATORY** **L T P C**
0 0 2 1

COURSE OBJECTIVES

- Identify the various functions of digital IC's.
- Design and Implement Magnitude comparator using MSI device
- Design and Implement Parity generator and checker using MSI device
- Design and analyse the various combinational circuits using MSI device.
- Design and analyse various sequential circuits using MSI device

LIST OF EXPERIMENTS

1. Design and implementation of Half/Full-Adder and Subtractor using basic Gates
2. Design and implementation of code converters using logic gates
   (i) BCD to excess-3 code and vice versa
   (ii) Binary to gray and vice-versa
3. Design and implementation of 4 bit binary Adder/ Subtractor and BCD adder using IC 7483
4. Design and implementation of 2 bit Magnitude Comparator using logic gates and 8 Bit Magnitude Comparator using IC 7485
5. Design and implementation of 16 BIT odd /even parity generator and checker using IC74180.
6. Design and implementation of Multiplexer and De-multiplexer using logic gates and study of IC74150 and IC 74154
7. Design and implementation of encoder and decoder using logic gates and study of IC7445 and IC74147
8. Construction and verification of 4 bit ripple counter and Mod-10 / Mod-12 Ripple counters using MSI circuits.
9. Design and implementation of 3-bit synchronous up-counter, down-counter using MSI circuits.
10. Implementation of Shift Register application SISO, SIPO, PISO, PIPO, Ring Counter and Johnson Counter using MSI circuits.
11. Design and Implementation of BCD to 7 segment display using Decoder IC.
12. Study of RAM as a Storage Device

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1: Apply Digital ICs for various applications.
CO2: Apply the Magnitude comparator using MSI device
CO3: Apply the operation of Parity generator and checker using MSI device
CO4: Implement the various combinational circuits using MSI device.
CO5: Implement and analyse various sequential circuits using MSI device

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Apply Digital ICs for various applications.	3	2	3	1	1		1					1		2	
Co2	Apply the Magnitude comparator using MSI device	3	3		2	3							1	3	1	

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Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co3	Apply the operation of Parity generator and checker using MSI device	3	2	3	2	1		1					1	3	1	
Co4	Implement the various combinational circuits using MSI device.	3	2	3	1	1		1					1	3	1	
Co5	Implement and analyze various sequential circuits using MSI device	3	2	3	1	1		1					1	3	1	

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418PRT01	PROBABILITY AND RANDOM PROCESSES	L T P C
		3 1 0 4

COURSE OBJECTIVES:

- Impart the knowledge of basic probabilistic theory.
- Learn one dimensional discrete and continuous probability distributions occurring in naturalphenomena.
- Extend the probability theory to two-dimensional random variable and to study the statisticalmeasures.
- Study the classification and analysis of few discrete random processes.
- Analyze the response of random inputs to linear time invariant systems.

UNIT I PROBABILITY AND RANDOM VARIABLE 9+3

Axioms of probability - Conditional probability - Total probability – Baye's theorem- Random variable - Probability mass function - Probability density function - Properties - Moments - Moment generating functions and their properties.

UNIT II PROBABILITY DISTRIBUTION 9+3

Binomial, Poisson, Geometric, Uniform, Exponential, and Normal distributions and their properties - Functions of a random variable-simple applications.

UNIT III TWO-DIMENSIONAL RANDOM VARIABLES 9+3

Joint distributions – Marginal and Conditional distributions – Covariance – Correlation and Linear regression – Central limit theorem (Statement and applications only for independent and identically distributed random variables).

UNIT IV RANDOM PROCESSES 9+3

Classification – Stationary process – Poisson process - Markov process - Discrete parameter Markov chain –Chapman-Kolmogorov equations – Random telegraph process-Application problems for each process.

UNIT V CORRELATION AND SPECTRAL DENSITIES 9+3

Auto-correlation functions, Cross-correlation functions , Power spectral density, Cross spectral density – Properties(Statements and Applications only) – Wiener-Khintchine relations (Statement and Applications only).

TOTAL HOURS:60 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1: Imbibe the knowledge of basic probability
CO2: Aquaint the ability of fitting the real time problems into probability distribution modals and interpret.
CO3: Learn the concept of two dimensional random variables helps to understand and analyse thestatistical measures which describe an outcome of a random experiment.
CO4: Understand and characterizing the random variable phenomenon which evolve with respect to timein a probabilistic approach.
CO5: Gain the concept of the linear system with random inputs.

TEXT BOOKS

1. Ibe, O.C.,"Fundamentals of Applied Probability and Random Processes", Elsevier, U.P., 1st Indian Reprint, 2007.

REFERENCE BOOKS

1. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", TataMcGraw Hill edition, New Delhi, 2014.
2. Veerarajan.T., "Probability, Statistics and Random Processes", Tata McGraw-Hill

publishing company Limited, New Delhi, 2014.
3. Kandasamy. P.,Thilagavathy, K.,& Gunavathi.K., "Probability, Statistics and random processes"., S.Chand & Company Ltd., New Delhi, 2014.
4. Peebles, P.Z., "Probability, Random Variables and Random Signal Principles", Tata McGraw Hill,4th edition, New Delhi, 2005.

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO3
Co1	Imbibe the knowledge of basic probability	3	2	3	1	1		1					1	3	1	
Co2	Aquaint the ability of fitting the real time problems into probability distribution modals andinterpret.	3	2	3	2	1		1					1		2	
Co3	Learn the concept of two dimensional random variables helps to understand and analyse the statistical measures which describe an outcome of a random experiment.	3	2	3	1	1		1					1		2	
Co4	Understand and characterizing the random variable phenomenonwhich evolve with respect to time in a probabilistic approach.	3	2	3	1	1		1					1		2	
Co5	Gain the concept of the linear system with random inputs.	3	2		2		1						1	3	1	

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418ECT02	Electrical Engineering and Instrumentation	L T P C
		3 0 0 3

COURSE OBJECTIVES:

- working principles of D.C. machines and their characteristics.
- Principle of operation and performance of transformer.
- Principle of operation and performance of AC machines.
- learn the concepts of DC and AC bridges.
- learn about importance of digital instruments in measurements

UNIT I DC MACHINES **9**

Construction details of DC machines – Theory of operation of DC generators – Characteristics of DC generators Operating principle of DC motors-EMF equation of DC generator– Types of DC motors and their characteristics – Speed control ofDC shunt motors-Numerical Problems- Applications.

UNIT II TRANSFORMERS **9**

Introduction – Single phase transformer construction and principle of operation – EMF equation of Transformer-Equivalent circuit of transformer – Regulation of transformer –Transformer losses and efficiency All day efficiency –auto transformer-Introduction of three phase transformer.

UNIT III INDUCTION MACHINES AND SYNCHRONOUS MACHINES **9**

Construction of Single phase induction motor-Types-Operation of single phase induction motor-Double revolving field theory-Construction of three phase induction motors –Principle operation of Three phase induction motor–Types – Construction details of Synchronous Machines – Operation Principle of synchronous machine –EMF Equation – starting methods of synchronous motors – Torque equation.(Qualitative Treatment only)

UNIT IV DC AND AC BRIDGES **9**

Measurement of Resistance- Kelvin's double bridge-Measurement of inductance - Maxwell's bridge, Anderson's bridge-Measurement of capacitance - Wien's bridge – Schering Bridge – Quality Factor.

UNIT V DIGITAL INSTRUMENTS **9**

Introduction to Digital Instruments - DMM – Digital Storage Oscilloscope- Q Meter- Digital Frequency Meter, DigitalEnergy Meter, Digital Tachometer, Digital pH Meter, Digital Phase Meter (Qualitative Treatment only).

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

- Acquire a good understanding of basics of electrical machines.
- Understanding the functions of transformer.
- Emphasis knowledge in basic concepts of AC machines.
- Analyze the operation of DC and AC bridges and its measurements.
- Analyze operation of digital instrumentation system with their applications

TEXT BOOKS

1. I.J Nagarath and Kothari DP, "Electrical Machines", McGrawHill Education (India) Pvt Ltd 4th Edition ,2010
2. A.K.Sawhney, "A Course in Electrical & Electronic Measurements and Instrumentation", Dhanpat Rai and Co, 2004.

REFERENCE BOOKS

1. Del Toro, "Electrical Engineering Fundamentals" Pearson Education, New Delhi, 2007.
2. W.D.Cooper&A.D.Helfrick, "Modern Electronic Instrumentation and Measurement Techniques", 5th Edition, PHI, 2002.
3. John Bird, "Electrical Circuit Theory and Technology", Elsevier, First Indian Edition, 2006. John Bird, "ElectricalCircuit Theory and Technology", Elsevier, First Indian Edition, 2006.
4. Thereja .B.L, "Fundamentals of Electrical Engineering and Electronics", S Chand & Co Ltd, 2008.
5. H.S.Kalsi, "Electronic Instrumentation", Tata Mc GrawHill Education, 2004.
6. J.B.Gupta, "Measurements and Instrumentation", S K Kataria& Sons, Delhi, 2003.

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Acquire a good understanding of basics of electrical machines.	3	2		2		1		1				1	3	1	
Co2	Understanding the functions of transformer.	3	2		2		1		1				1	3	1	
Co3	Emphasis knowledge in basic concepts of AC machines.	3	2		2		1						1	3	1	
Co4	Be able to analyze the operation of DC and AC Bridges and its measurements.	3	2		2		1		1				1	3	1	
Co5	Be able to analyze operation of digital instrumentation systemwith their applications	3	2		2		1						1	3	1	

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418ECT03	LINEAR INTEGRATED CIRCUITS	L T P C
		3 0 0 3

COURSE OBJECTIVES:

- Describe the Operational Amplifier and its characteristics
- Learn the linear and non-linear applications of operational amplifiers
- Define the theoretical concept and applications of PLL
- Understand the Concept of distinct types of A-D and D-A converters
- Describe the operational principle of voltage regulators and Special function ICs

UNIT I OPERATIONAL AMPLIFIER CHARACTERISTICS 9

OPERATIONAL AMPLIFIER CHARACTERISTICS: Internal circuit diagram of IC741, characteristics of an ideal operational amplifier, op-amp with negative feedback,, General operational amplifier stages open loop gain, input offset voltage, input bias current, input offset current, total output offset voltage, frequency response of op-amp, stability, slew rate and methods of improving slew rate.

CIRCUIT CONFIGURATION FOR LINEAR IC'S: Current mirror and current sources, Current sources as active loads, Voltage Sources, Voltage References.

UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIERS 9

Application of Op-Amp: Inverting and Non-Inverting amplifiers, voltage follower, summing amplifier, Differential amplifier, Instrumentation amplifiers, Differentiator, Integrator, Voltage to Current converter and Current to Voltage converter, Sine wave Oscillators, comparator and Schmitt trigger, Precision rectifier, Log and Antilog amplifiers, Clipper and Clamper, Sample and hold circuit.
Active Filters: Design of Low Pass and High Pass filters, Band pass Butterworth filters

UNIT III PHASED LOCKED LOOP & ITS APPLICATIONS 9

PLL -principle of operation, building blocks of PLL, Characteristics, Derivation of expression of Lock & Capture range, IC 566-Voltage controlled oscillator, Monolithic PLL IC 565- Functional block diagram, Applications of PLL: AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing.

UNIT IV A-D AND D-A CONVERTERS 9

A/D conversion: Ramp converters, Flash type, Successive Approximation, Dual slope converters, Parallel A/D converters, Tracking A/D converters, Single Slope type, A/D converters using Voltage-to-Time Conversion - Over-sampling A/D Converters.
D/A conversion:D/A conversion fundamentals, weighted resistor summing D/A Converter, R-2R Ladder D/A converter.

UNIT V VOLTAGE REGULATORS & SPECIAL FUNCTION ICs 9

IC Voltage regulators-IC LM7805-Line Regulation - Load Regulation -Adjustable Output Voltage Regulator, Switched Mode Power Supply, IC L8038 -Function generator-Functional Block Diagram, Timer IC 555- Functional Block Diagram, Applications-Astable and Monostable Multivibrator, Frequency to Voltage and Voltage to Frequency converters.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

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CO1: Explain the principle of operational amplifier and its characteristics
CO2: Demonstrate the various applications of operational amplifier
CO3: Generalize the theory of phased lock loop and its characteristics
CO4: Examine the concept of A-D and D-A converters using operational amplifier
CO5: Summarize how operational amplifier can be modeled as voltage regulator and Special function IC

TEXT BOOKS

1. Sergio Franco, Design with operational amplifiers and analog integrated circuits, 3rd Edition, Tata McGraw-Hill, 2007.
2. D.RoyChoudhry, Shail Jain, Linear Integrated Circuits, New Age International Pvt. Ltd., 2000.
3. S.Salivahanan& V.S. Kanchana Bhaskaran, Linear Integrated Circuits, TMH, 2008.
4. Gayakwad A R,"Op-Amps and Linear Integrated circuits," Pearson Education, NewDelhi, Fourth Edition, 2004 Prentice Hall of India, New Delhi

REFERENCE BOOKS

1. B.S.Sonde, System design using Integrated Circuits, New Age Pub, 2nd Edition,2001
2. Gray and Meyer, Analysis and Design of Analog Integrated Circuits, Wiley International, 2005.
3. J.Michael Jacob, Applications and Design with Analog Integrated Circuits, Prentice Hall of India, 1996.
4. William D.Stanley, Operational Amplifiers with Linear Integrated Circuits, Pearson Education, 2004.
5. Botkar K.R., "Integrated Circuits ", Khanna Publishers, 1996
6. Caughlier and Driscoll, "Operational amplifiers and Linear Integrated circuits", Prentice Hall, 1989.
7. Millman J. and Halkias C.C., "Integrated Electronics ", McGraw Hill, 2001.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Explain the principle of operational amplifier and its characteristics	3	2	3	1	3							1	3	1	
Co2	Demonstrate the various applications of operational amplifier	3	2	3	1	3							1	3	1	
Co3	Generalize the theory of phased lock loop and its characteristics	3	2	3	1	3							1	3	1	
Co4	Examine the concept of A-D and D-A converters using operational amplifier	3	2	3	1	3							1	3	1	
Co5	Summarize how operational amplifier can be modeled as voltage regulator and Special function IC	3	2	3	1	3							1	3	1	

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418ECT04	ANALOG ELECTRONICS – II	L T P C 3 0 0 3

COURSE OBJECTIVES:

- Investigate the various classification of feedback amplifiers for single and multi stage modes
- Analyze of different categories of tuned amplifiers
- Learn the concept of sustained oscillation for different types of oscillators
- Illustrate the concept of clampers, multi-vibrators and wave shaping circuits
- Discuss the features of ramp generators, sine wave converters and time base generators

UNIT I FEEDBACK AMPLIFIERS 9

Concept of feedback- topological classification-voltage series, voltage shunt, current series, current shunt - effect of feedback on gain, stability, distortion, band width, input and output impedances multistage feedback amplifier- Analysis of voltage series and current series Practical feedback amplifiers circuits.

UNIT II TUNED AMPLIFIERS 9

Coil losses, unloaded and loaded Q of tank circuits, small signal tuned amplifiers -Analysis of single tuned amplifier and its bandwidth–Analysis of double tuned amplifier and its bandwidth - Stagger tuned amplifiers - large signal tuned amplifiers - Class C tuned amplifier-Efficiency and applications of Class C tuned amplifier - Stability of tuned amplifiers.

UNIT III OSCILLATORS 9

Barkhausen criterion for sustained oscillations - RC oscillators – RC phase shift oscillator-Ring Oscillators and Wein-bridge oscillator- resonant circuit oscillators –LC oscillators- Hartley and Colpitt's oscillators – crystal oscillators and frequency stability.

UNIT IV WAVE SHAPING CIRCUITS AND MULTIVIBRATORS 9

Low pass RC circuit – integrator - High pass RC circuit – differentiator- Clamper circuits – positive, negative and biased clampers -Voltage doubler, tripler and quadrupler circuits. Multi-vibrators – design of transistor astable, monostable and bistable multi-vibrators using transistors– Schmitt trigger circuit.

UNIT V TIME BASE GENERATORS 9

General features of time base signals – RC ramp generator – constant current ramp generator, UJT saw tooth generator – Bootstrap ramp generator – Miller integrator ramp generator – triangular waveform generator – pulse generator circuit– function generator – sine wave converter-Current time base generators

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1: Design the various types of feedback amplifiers for single and multi stage modes
CO2: Identify the various types of tuned amplifiers
CO3: Interpret the operation of oscillators for different real time applications
CO4: Demonstrate the concept of clampers, multi-vibrators and wave shaping circuits
CO5: Manipulate the features of ramp generators, sine wave converters and time base generators

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TEXT BOOKS

1. Millman and Halkias, "Integrated Electronics", Tata McGraw Hill International Edition, 2002.
2. R. L. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", PHI
3. Learning Pvt. Ltd, Ninth Edition, 2008
4. David A. Bell, "Solid State Pulse circuits", PHI Learning Private Ltd, Fourth Edition, 2007

REFERENCE BOOKS

1. David A. Bell, "Electronic Devices and Circuits", PHI Learning Private Ltd, Fourth Edition, 2007
2. Sedra / Smith, "Micro Electronic Circuits", Oxford University Press, 2004.
3. Salivahanan, N. Suresh Kumar and A. Vallavaraj, Electronic Devices and Circuits, 2nd Edition, TMH, 2007

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Design the various types of feedback amplifiers for single and multi stage modes	3	2	3	1	3							1		2	
Co2	Identify the various types of tuned amplifiers	3	2	3	1	3							1		2	
Co3	Interpret the operation of oscillators for different real time applications	3	2	3	1	3							1		2	
Co4	Demonstrate the concept of clampers, multi-vibrators and wave shaping circuits	3	2	3	1	3							1	3	1	
Co5	Manipulate the features of ramp generators, sine wave converters and time base generators	3	2	3	1	3							1	3	1	

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418ECP07 **ELECTRICAL ENGINEERING LABORATORY** **L T P C**

0 0 2 1

COURSE OBJECTIVES:

- Study the working principles of D.C. machines and their characteristics.
- Study the Principle of operation and performance of transformer.
- Study the Principle of operation and performance of AC machines.
- Learn the concepts of DC and AC bridges.
- Learn about importance of digital instruments in measurements

LIST OF EXPERIMENTS

1. Open circuit and load characteristics of a self-excited DC shunt Generator
2. Load characteristics of DC shunt motor
3. Speed control of DC shunt motor
4. Load test on single-phase transformer
5. Open circuit and short circuit tests on single phase transformer
6. Load test on single phase induction motor
7. Load test on three-phase squirrel cage induction motor
8. Characteristic of LVDT
9. AC bridges - Measurement of inductance, capacitance
10. DC bridges - Wheatstone bridge
11. A/D and D/A converters
12. Calibration of single-phase energy meter

COURSE OUTCOMES

Upon Completion of this course, students will be able to:

CO1: Acquire a good understanding of basics of electrical machines.
CO2: Understanding the functions of transformer.
CO3: Emphasis knowledge in basic concepts of AC machines.
CO4: Analyze the operation of DC and AC bridges and its measurements.
CO5: Analyze operation of digital instrumentation system with their applications

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
Co1	Calculation of EMF equation for the self- excited generators.	3	2	3	1	3							1	3	1	
Co2	Ability to analyze the various parameters of the motor and transformer.	2	3	2	1								1	3	1	
Co3	Analyze and study the displacement and pressure transducers.	3	2	3	1	3							1	3	1	
Co4	Ability to make measurements and interpret data on various bridges.	2	3		1								1	3	1	
Co5	Compare and contrast calibrations of single phase energy meter and current	3			2				2				1	3	1	

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418ECP08	LINEAR INTEGRATED CIRCUITS LABORATORY	L T P C 0 0 2 1

COURSE OBJECTIVES:

- Demonstrate an understanding the Characteristics of op-amp
- Construct the op-amp circuits for various applications
- Demonstrate wave shaping circuits using op-amp
- Study of power supplies and its regulation
- Simulate op-amp circuits for various applications by using Multisim tool

LIST OF EXPERIMENTS

1. Inverting, Non inverting and differential amplifiers.
2. Integrator and Differentiator.
3. Instrumentation amplifier
4. Active low pass, High-pass and band-pass filters.
5. Astable & Monostable multi-vibrators using op-amp.
6. Schmitt Trigger using op-amp.
7. Phase shift and Wien bridge oscillators using op-amp.
8. Astable and monostable multi-vibrators using NE555 Timer.
9. PLL characteristics and its use as Frequency Multiplier.
10. Study of Voltage Regulator ICs.
11. Study of SMPS.

SIMULATION USING MULTISIM

1. Instrumentation amplifier
2. Active low pass, High pass and band pass filters.
3. Astable & Monostable multi-vibrators using op-amp.
4. Schmitt Trigger using op-amp.
5. Phase shift and Wien bridge oscillators using op-amp.

INNOVATIVE PROJECTS: Automatic Street Light using 555 Timer, Rainfall Detector Alarm using 555 Timer & Rain Sensor , Automatic LED Blinking Circuit using 555 Timer IC – LED Flasher, Automatic Predefined Time Lamp Turn ON Project

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1: Determine the Characteristics of op-amp
CO2: Modify the op-amp circuits for various applications
CO3: Extrapolate wave shaping circuits using op-amp
CO4: Describe the power supplies and its regulation
CO5: Design op-amp circuits for various applications by using Multisim tool.

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Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Determine the Characteristics of op-amp	3	2	1									1	3	1	
Co2	Modify the op-amp circuits for various applications	3	2	1									1	3	1	
Co3	Extrapolate wave shaping circuits using op-amp	3	2	1									1	3	1	
Co4	Describe the power supplies and its regulation	3	2	1									1	3	1	
Co5	Design op-amp circuits for various applications by using Multisim tool	3	2	1									1	3	1	

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418ECP09 **ANALOG ELECTRONICS - II LABORATORY** **L T P C**
0 0 2 1

COURSE OBJECTIVES:

- Demonstrate an understanding of Negative feedback amplifiers using discrete BJT
- Demonstrate an understanding of oscillator using discrete BJT
- Design of Wave Shaping Circuits using discrete BJT
- Construct the multivibrators using discrete BJT
- Simulate Negative feedback amplifiers, Multivibrators, Boot strap ramp generator and Miller Integrator Ramp generator using Multisim tool

LIST OF EXPERIMENTS

1. Negative feedback amplifiers: Voltage Series and Voltage Shunt feedback amplifiers
2. Tuned class C amplifier
3. RC Phase shift oscillator, Wien Bridge Oscillator
4. Hartley Oscillator, Colpitts Oscillator
5. Wave Shaping Circuits : Integrators, Differentiators, Clippers and Clampers
6. Multivibrators: Astable, Monostable and Bistable
7. Miller Integrator Ramp Generator

SIMULATION USING MULTISIM

1. Negative feedback amplifiers: Current Series and Current Shunt feedback amplifiers
2. Voltage Doubler and Tripler
3. Multivibrators: Astable, Monostable ,Bistable and Schmitt trigger
4. Boot Strap Ramp Generator
5. UJT Sawtooth Generator

INNOVATIVE PROJECTS:
Water level alarm, USB mobile charger circuit, Bike turning signal circuit, 555 timer IC testing circuit, Dancing bike colour LED light circuit

COURSE OUTCOMES
Upon Completion of this course, students will be able to :

CO1: Measure the frequency response of Negative feedback amplifiers using discrete BJT
CO2: Design an oscillator circuits using discrete BJT
CO3: Construct the Wave Shaping Circuits using discrete BJT
CO4: Demonstrate the multi-vibrators using discrete BJT
CO5: Design Negative feedback amplifiers, Multi-vibrators, Boot strap ramp generator and Miller Integrator Ramp generator using Multisim tool

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Describe the power supplies and its regulation	3	2	1									1	3	1	

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Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co2	Design op-amp circuits for various applications by using Multisim tool	3	2	1									1	3	1	
Co3	Determine total response, impulse response and frequency response of LTI-CT systems	3	2	1									1	3	1	
Co4	Analyze the discrete time signals using Discrete Time Fourier Transforms and Z transform	3	2	3	1	3							1	3	1	
Co5	Determine total response, impulse response and frequency response of LTI-DT systems									1	3	1	2	1		3

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418ECE01	INDUSTRIAL ELECTRONICS	L T P C
		3 0 0 3

COURSE OBJECTIVES:

- Discuss the behavior of SCR and TRIAC circuits
- Analyze of voltage regulators using SCR for various speed control applications
- Study the principle of Industrial Heating and thermal losses under RF
- Classify the Industrial Timing Circuits and its components
- Learn the PLC programming skills for industrial automation applications .

UNIT I THYRISTORS 9

SCR – SCR behaviour and rating – Phase control of SCR – Turn-off of SCR – SCR with resistive load and inductive load – Rectifiers with back EMF load – TRIAC – TRIAC circuits – Phase control of SCR.

UNIT II VOLTAGE AND MOTOR SPEED REGULATORS 9

Voltage compensator – Solid state DC voltage regulation – DC shunt motor – Armature control and field control of motor speed – Electronic control of DC motor – Speed regulator action – Full wave motor speed regulation by one SCR

UNIT III INDUSTRIAL HEATING 9

Induction heating – Principles- Theory – Merits – Applications – High frequency power source for induction heating Dielectric heating – Theory – Electrodes used in dielectric heating – Method of coupling of electrodes to RF generator – Thermal losses in dielectric heating

UNIT IV INDUSTRIAL TIMING CIRCUITS 9

Constituents of industrial timing circuits – Timers – Classification of timers – Thermal timers – Electromechanical timers – Electronic timers – Classification of electronic timers – Digital timing element –Digital counters – SCR delay timer – IC electronic timer.

UNIT V PROGRAMMABLE LOGIC CONTROLLERS 9

Number system and codes – Basics of PLC programming – Timer and counter instructions – Data manipulation instructions – Shift register and sequence instructions.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1: Explain the behavior of SCR and TRIAC circuits
CO2: Design the voltage regulators using SCR and various speed control methods
CO3: Identify the thermal losses and Manipulate the Industrial Heating under RF
CO4: Recognize the various Industrial Timing Circuits
CO5: Develop the PLC programming for industrial applications

TEXT BOOKS

1. Frank D. Petruzella, Industrial Electronics, McGraw Hill International Editions, 1996
2. G.K. Mithal, Ravi Mithal, Industrial Electronics, Khanna Publishers, Delhi, 1995
3. George M. Chute, Robert D. Chute, Electronics in Industry, McGraw Hill International Edition

REFERENCE BOOKS

1. M. H. Rashid, "power Electronics Circuits, Devices and Application", PHI, 3rd edition, 2004.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Explain the behavior of SCR and TRIAC circuits	2	3	2	1								1	3	1	
Co2	Design the voltage regulators using SCR and various speed control methods	3	2	1									1	3	1	
Co3	Identify the thermal losses and Manipulate the Industrial Heating under RF	3	2	1									1	3	1	
Co4	Recognize the various Industrial Timing Circuits	3	2	1									1	3	1	
Co5	Develop the PLC programming for industrial applications	3	2	1									1	3	1	

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418ECE02	CONSUMER ELECTRONICS	L T P C
		3 0 0 3

COURSE OBJECTIVES:

- Learn the concepts of audio system and processing.
- Study the operation of Television system and DTH.
- Infer the knowledge in Telecommunication systems.
- Identify the various commercial electronic applications.
- Identify the various domestic electronic applications

UNIT I AUDIO SYSTEM **9**

Home Audio systems ,Microphones, Head Phones and Hearing Aids, Loud Speakers, Loud Speaker Systems, Optical Recording and reproduction systems – CDs, DVDs, Blue ray technology, iPods, MP4 players and accessories.

UNIT II TELEVISION SYSTEM **9**

Elements of TV Communication System, Scanning, Composite Video signal, Need for synchronizing and blanking pulses, Picture Tubes, Construction and working of Camera Tubes, Block diagram of TV Receiver, TFT- LCD and Plasma TV fundamentals, Block diagram and principles of working of cable TV and DTH.

UNIT III TELECOMMUNICATION SYSTEMS **9**

Basics of Telephone system, Radio system – VHF and UHF – Types of mobile phones- Caller ID Telephone, Intercoms, Cordless Telephones, Cellular mobile systems.

UNIT IV ELECTRONICS **9**

Automatic Teller Machines, Facsimile machines, Digital Diaries, Safety and security systems, Bar Coders – Bar codes, scanner and decoder.

UNIT V HOME ELECTRONICS **9**

Digital Camera system, Microwave ovens, Washing Machines, Air Conditioners and Refrigerators,Dish washers and Set Top Box.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1: Explain the concepts of audio system and processing
CO2: Describe the operation of Television system and DTH
CO3: Demonstrate the functions Telecommunication systems
CO4: Show the various commercial electronic applications
CO5: Show the various domestic electronic applications

TEXT BOOKS

1. S.P.Bali, Consumer Electronics, Pearson Education, 2005.
2. R.R.Gulati ,Monochrome and Color Television New Age International Publisher,2001

REFERENCE BOOKS

1. C.A. Schuler and W.L. .Mc Namee, Modern Industrial Electronics, McGraw Hill, 2002.

2. D.J. Shanefield, Industrial Electronics for Engineers, Chemists and Technicians, Jaico Publishing House, 2007.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS O3
Co1	Explain the concepts of audio system and processing	3	2	1									1	3	1	
Co2	Describe the operation of Television system and DTH	3	2	1									1	3	1	
Co3	Demonstrate the functions Telecommunication systems	3	2	3	1	3							1	3	1	
Co4	Show the various commercial electronic applications	3	2	1									1	3	1	
Co5	Show the various domestic electronic applications	3	2	1									1	3	1	

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418ECE03	GREEN ELECTRONICS	L T P C
		3 0 0 3

COURSE OBJECTIVES:

- Discuss about the knowledge on the theories, eco-design concepts, methods for designing a range of sustainable green electronic products with the recommended standards and regulations.
- Address relevant issues on Green Electronic products and materials for electronic design
- Study the applications of green electronic systems
- Acquire comprehensive and in-depth knowledge of reliability of green electronics systems
- Learn the importance of green nanotechnology

UNIT I INTRODUCTION TO GREEN ELECTRONICS AND ENVIRONMENTAL REGULATIONS 9

Environmental concerns of the modern society-Overview of electronics industry and their relevant regulations in India, European Union and other key countries-Restriction of Hazardous substances (RoHS)-Waste Electrical and electronic equipment (WEEE)-Energy using Product (EuP) and Registration, Evaluation, Authorisation and Restriction of Chemical substances (REACH).

UNIT II FABRICATION OF GREEN PWB & GREEN FINISHES FOR IC COMPONENTS 9

Introduction - Impact of Assembly Processes-Impact of Electronic Design-PWB construction-Material Screening- Green Finishes for IC components- Lead frame finish Evolution-Component finish requirements-Tin Based finishes for IC Components-PPF Component finishes-Comparison-Tin Whiskers- X-Ray Fluorescence (XRF) for identifying hazardous substances in electronic products-Recycling

UNIT III GREEN ELECTRONIC SYSTEMS AND APPLICATIONS 9

Introduction- OLED- General Characteristics -Structure- Hopping and recombination-Emission Spectrum-Doping-Encapsulation-Optical Cavity-Wave guiding properties-Conductivity-Life Time-Electro-Optical Characteristics-Emission-Emission Intensity-VI Characteristics-OPV -Device Structures-Working principle-OLED TV- Features.

UNIT IV RELIABILITY OF GREEN ELECTRONIC SYSTEMS 9

Reliability-Reliability measures-Weibull Distribution-Lead free Solder interconnections-Lead free solders-Tin/Lead baseline-properties-test environments-Lead free solderable finishes-PCB reliability issues-Connector issues.

UNIT V GREEN NANOTECHNOLOGY 9

Introduction-Importance of Nanotechnology to Green Electronics- manufacture of Nanomaterials-Application areas in Electronics-Nanoapplication examples-Nano Solders.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Recognize the importance of various environmental regulations in different major countries around the world and the need for compliance with these regulations.

CO2: Describe the process, designtechniques, manufacturing of green electronics systems and assessment of the environmental hazards and suggest ways to reduce them.

CO3: Apply the principles and practices of green electronics in selected consumer products.

CO4: Analyze the reliability of green electronic systems

CO5: Describe the significance of green electronics to nanotechnology domain

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TEXT BOOKS

1. Goldberg L.H., Green Electronics / Green Bottom Line, Environmentally Responsible Engineering, 1st Edition Newnes 2000 ISBN 0-7506-9993-0
2. Shina, Sammy G. Green Electronics Design and Manufacturing. New York: McGraw-Hill Professional, 2008.
3. Wimmer, Wolfgang et.al. Ecodesign Implementation: A Systematic Guidance on Integrating Environmental Consideration into Product Development. Berlin: Springer, 2014.

REFERENCE BOOKS

1. John H. Lau (2003). Electronics manufacturing: with lead-free, halogen-free, and conductive-adhesive materials. New York: McGraw-Hill. 1v
2. WEEE : http://ec.europa.eu/environment/waste/weee/index_en.htm
3. REACH : http://ec.europa.eu/environment/chemicals/reach/reach_intro.htm

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Recognize the importance of various environmental regulations in different major countries around the world and the need for compliance with these regulations.						3	2	3	2		3		3	1	
Co2	Describe the process, design techniques, manufacturing of green electronics systems and assessment of the environmental hazards and suggest ways to reduce them.	3	2	1									1	3	1	
Co3	Apply the principles and practices of green electronics in selected consumer products.	3	2	3	1	3							1	3	1	
Co4	Analyze the reliability of green electronic systems	3	2	1									1	3	1	
Co5	Describe the significance of green electronics to nanotechnology domain	3	2	1									1	3	1	

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418ECE04	OPTOELECTRONIC DEVICES	L T P C
		3 0 0 3

COURSE OBJECTIVES:

- Discuss the Polarization, Interference and diffraction of light
- Infer the operation of LASER and various display devices
- Discuss the various optical detection devices like photo detector, thermal detector, photo diodes etc..,
- Extend the application of optoelectronic devices as different optical modulator
- Infer the knowledge in opto-electronics integrated circuits and guided wave devices

UNIT I ELEMENTS OF LIGHT AND SOLID STATE PHYSICS 9

Wave nature of light- Polarization- Interference- Diffraction- Light Source- review of Quantum Mechanical concept- Review of Solid State Physics- Review of Semiconductor Physics and Semiconductor Junction Device.

UNIT II DISPLAY DEVICES AND LASERS 9

Introduction- Photo Luminescence- Cathode Luminescence- Electro Luminescence- Injection Luminescence- LED- Plasma Display- Liquid Crystal Displays- Numeric Displays- Laser Emission- Absorption- Radiation- Population Inversion- Optical Feedback- Threshold condition- Laser Modes- Classes of Lasers- Mode Locking- laser applications.

UNIT III OPTICAL DETECTION DEVICES 9

Photo detector- Thermal detector- Photo Devices- Photo Conductors- Photo diodes- Detector Performance.

UNIT IV OPTOELECTRONIC MODULATOR 9

Introduction- Analog and Digital Modulation- Electro-optic modulators- Magneto Optic Devices- Acousto – Opticdevices- Optical- Switching and Logic Devices.

UNIT V OPTOELECTRONIC INTEGRATED CIRCUITS 9

Introduction- hybrid and Monolithic Integration- Application of Opto Electronic Integrated Circuits- Integrated transmitters and receivers- Guided wave devices.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1: Explain the Polarization, Interference and diffraction of light
CO2: Demonstrate the operation of LASER and various display devices
CO3: Describe the various optical detection devices like photo detector, thermal detector, photo diodes etc..,
CO4: Extrapolate the application of optoelectronic devices as different optical modulator
CO5: Explain the opto-electronics integrated circuits and guided wave devices

TEXT BOOKS

1. J- Wilson and J-Haukes- "Opto Electronics – An Introduction"- Pearson/Prentice Hall of India Pvt- Ltd-- New Delhi- 2007

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2. Bhattacharya "Semiconductor Opto Electronic Devices"- Pearson/Prentice Hall of India Pvt-- Ltd-- New Delhi- 2006

REFERENCE BOOKS

1. Jasprit Singh- "Opto Electronics – As Introduction to materials and devices" McGraw-Hill International Edition- 1998.
2. Joachim Piprek, Semiconductor Optoelectronic Devices, Elsavier-2003
3. S. O. Kasap, SafaKasap, Optoelectronics and Photonics: Principles and Practices,PHI-2001

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Explain the Polarization, Interference and diffraction of light	3	2	1									1	3	1	
Co2	Demonstrate the operation of LASER and various display devices	3	2	1									1	3	1	
Co3	Describe the various optical detection devices like photo detector, thermal detector, photo diodes etc..,	3	2	3	1	3							1	3	1	
Co4	Extrapolate the application of optoelectronic devices as different optical modulator	3	2	3	1	3							1	3	1	
Co5	Explain the opto-electronics integrated circuits and guided wave devices	3	2	1									1	3	1	

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418ECE05	PCB DESIGN	L T P C
		3 0 0 3

COURSE OBJECTIVES:

- Discuss the concepts of connectivity, components and manufacturing of PCB
- Infer the knowledge in various drawing and design rules in Layout planning and design of PCB
- Generalize the design rules for Analog and Digital circuits
- Discuss the concept of various image transfer techniques
- Conceive various plating and etching technique

UNIT I INTRODUCTION TO PRINTED CIRCUIT BOARDS 9

Connectivity in Electronic Equipment-Evolution of Printed Circuit Boards,Components of a Printed Circuit Board,Classification of Printed Circuit Boards,Manufacturing of Basic Printed Circuit Boards,Challenges in Modern PCB Design and Manufacture ,Major Market Drivers for the PCB Industry , PCBs with Embedded Components ,Standards on Printed Circuit Boards , Useful Standards .

UNIT II LAYOUT PLANNING AND DESIGN 9

Reading Drawings and Diagrams,General PCB Design Considerations,Mechanical Design Considerations,Electrical Design Considerations,Conductor Patterns,Component Placement Rules,Fabrication and Assembly Considerations,Environmental Factors,Cooling Requirements and Packaging Density,Layout Design,Layout Design Checklist.

UNIT III DESIGN CONSIDERATIONS FOR SPECIAL CIRCUITS 9

Design Rules for Analog Circuits,Design Rules for Digital Circuits,Design Rules for High Frequency Circuits,Design Rules for Fast Pulse Circuits,Design Rules for PCBs for Microwave Circuits,

UNIT IV IMAGE TRANSFER TECHNIQUES 9

Laminate Surface Preparation,Screen Printing,Pattern Transferring Techniques,Printing Inks,Printing Process,Photo Printing,Laser Direct Imaging

UNIT V PLATING AND ETCHING 9

PLATING: Electroplating,Plating Techniques,General Problems in Plating,General Plating Defects,Special Plating Techniques.

ETCHING:Etching Solutions,Etching Arrangements,Etching Parameters, Equipment and Techniques

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1: Explain the concepts of connectivity, components and manufacturing of PCB
CO2: Manipulate various drawing and design rules in Layout planning and design of PCB
CO3: Extrapolate the design rules for Analog and Digital circuits
CO4: Describe the concept of various image transfer techniques
CO5: Identify the defects in Plating and Etching process

TEXT BOOKS

1. Raghbir Singh Khandpur, Printed circuit boards _ design_ fabrication_ assembly and testing-McGraw-Hill (2006).

REFERENCE BOOKS

1. Walter C. Bosshart, Printed Circuit Boards: Design and Technology, McGraw-Hill Inc. US (2008).

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Explain the concepts of connectivity, components and manufacturing of PCB	3	2	3	1	3							1	3	1	
Co2	Manipulate various drawing and design rules in Layout planning and design of PCB	3	2	1									1	3	1	
Co3	Extrapolate the design rules for Analog and Digital circuits	3	2	3	1	3							1	3	1	
Co4	Describe the concept of various image transfer techniques									1	3	1	2	1		3
Co5	Identify the defects in Plating and Etching process	3	3		2								1	3	1	

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418ECE06	SOLID STATE DEVICES	L T P C
		3 0 0 3

COURSE OBJECTIVES:

- Learn the crystal structures of elements used for fabrication of semiconductor devices.
- Infer the concept of fermi levels, movement of charge carriers, Diffusion current and Drift current.
- Study the characteristics, operations of various MOSFET
- Analyze various opto-electronics devices
- Infer the operation of different high power devices like tunnel diodes, IMPATT, TRAPATT etc

UNIT I CRYSTAL PROPERTIES AND GROWTH OF SEMICONDUCTORS 9

Semiconductor materials - Periodic Structures - Crystal Lattices - Cubic lattices - Planes and Directions - Diamond lattice - Bulk Crystal Growth - Starting Materials - Growth of Single Crystal Ingots - Wafers - Doping - Epitaxial Growth - Lattice Matching in Epitaxial Growth - Vapor - Phase Epitaxy - Atoms and Electrons - Introduction to Physical Models - Experimental Observations - Photoelectric Effect - Atomic spectra - Bohr model - Quantum Mechanics - Probability and Uncertainty Principle - Schrodinger Wave Equation - Potential Well Equation - Potential well Problem - Tunneling.

UNIT II ENERGY BANDS AND CHARGE CARRIERS IN SEMICONDUCTORS AND JUNCTIONS 9

Energy bands in Solids, Energy Bands in Metals, Semiconductors, and Insulators - Direct and Indirect Semiconductors - Variation of Energy Bands with Alloy Composition - Charge Carriers in Semiconductors - Electrons and Holes - Electrons and Holes in Quantum Wells - Carrier Concentrations - Fermi Level - Electron and Hole Concentrations at Equilibrium - Temperature Dependence of Carrier Concentrations - Compensation and Space Charge Neutrality - Drift of Carrier in Electric and Magnetic Fields conductivity and Mobility - Drift and Resistance - Effects of Temperature and Doping on Mobility - High field effects - Hall Effect - invariance of Fermi level at equilibrium - Fabrication of p-n junctions, Metal semiconductor junctions.

UNIT III METAL OXIDE SEMICONDUCTOR FET 9

GaAS MESFET - High Electron Mobility Transistor - Short channel Effects - Metal Insulator Semiconductor FET - Basic Operation and Fabrication - Effects of Real Surfaces - Threshold Voltage - MOS capacitance Measurements - current - Voltage Characteristics of MOS Gate Oxides - MOS Field Effect Transistor - Output characteristics - Transfer characteristics - Short channel MOSFET V-I characteristics - Control of Threshold Voltage - Substrate Bias Effects - Sub threshold characteristics - Equivalent Circuit for MOSFET - MOSFET Scaling and Hot Electron Effects - Drain - Induced Barrier Lowering - short channel and Narrow Width Effect - Gate Induced Drain Leakage.

UNIT IV OPTOELECTRONIC DEVICES 9

Photodiodes - Current and Voltage in illuminated Junction - Solar Cells - Photo detectors - Noise and Bandwidth of Photo detectors - Light Emitting Diodes - Light Emitting Materials - Fiber Optic Communications Multilayer Heterojunctions for LEDs - Lasers - Semiconductor lasers - Population Inversion at a Junction Emission Spectra for p-n junction - Basic Semiconductor lasers - Materials for Semiconductor lasers.

UNIT V HIGH FREQUENCY AND HIGH POWER DEVICES 9

Tunnel Diodes, IMPATT Diode, operation of TRAPATT and BARITT Diodes, Gunn Diode - transferred - electron mechanism, formation and drift of space charge domains, p-n-p-n Diode, Semiconductor Controlled Rectifier, Insulated Gate Bipolar Transistor

TOTAL HOURS:45 PERIODS

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COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Describe the crystal structures of elements used for fabrication of semiconductor devices.

CO2: Explain the concept of fermi levels, movement of charge carriers, Diffusion current and Drift current.

CO3: Describe the characteristics, operations of various MOSFET

CO4: Identify the various opto-electronics devices

CO5: Demonstrate the operation of different high power devices like tunnel diodes, IMPATT, TRAPATT etc

TEXT BOOKS

1. Ben. G. Streetman &Sanjan Banerjee, Solid State Electronic Devices, 5th Edition, PHI, 2003

REFERENCE BOOKS

1. YannisTsividis, Operation & Mode line of MOS Transistor, 2nd Edition, Oxford University Press, 1999
2. Donald A. Neaman, Semiconductor Physics and Devices, 3rd Edition, TMH, 2002.
3. D.K. Bhattacharya &Rajinish Sharma, Solid State Electronic Devices, Oxford University Press, 2007

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Describe the crystal structures of elements used for fabrication of semiconductor devices.	2	3		1	2							1	3	1	
Co2	Explain the concept of fermi levels, movement of charge carriers, Diffusion current and Drift current.	2	3		1	2							1	3	1	
Co3	Describe the characteristics, operations of various MOSFET	3	2		3	2				1			1	2	3	
Co4	Identify the various opto-electronics devices	2	3		1	2							1		3	
Co5	Demonstrate the operation of different high power devices like tunnel diodes, IMPATT, TRAPATT etc.	3	2		3	2				1			1		3	

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515ECT02	DIGITAL SIGNAL PROCESSING	L T P C 3 1 0 4

COURSE OBJECTIVES:

- Compute FFT of a discrete time signal.
- Design the various FIR filter techniques.
- Design the various IIR filter techniques.
- Analyze the finite word length effects in signal processing.
- Devise the fundamentals of digital signal processors.

UNIT I FAST FOURIER TRANSFORM AND CONVOLUTION 9+3

Introduction to DFT – Efficient computation of DFT- Properties of DFT – FFT algorithms – Radix-2 FFT algorithms – Decimation in Time – Decimation in Frequency algorithms –sectioned convolution- overlap add method- overlap save method.

UNIT II FINITE IMPULSE RESPONSE DIGITAL FILTERS 9+3

Linear phase filters-Frequency response of linear phase FIR filters-Fourier series method of designing FIR filters-Windowing techniques for design of linear phase FIR filters: Rectangular- Hamming- Hanning-Blackman windows. Gibbs phenomenon –principle of frequency sampling technique- Realization - FIR filters-Direct form,Cascade ,Linear phase FIR realization.

UNIT III INFINITE IMPULSE RESPONSE DIGITAL FILTERS 9+3

Review of design of analogue Butterworth and Chebyshev Filters- Frequency transformation in analog domain – Design of IIR digital filters using impulse invariance technique –bilinear transformation – pre warping –Frequency transformation in digital domain – IIR Filter Realization - Direct form I, Direct form II, cascade and parallel.

UNIT IV FINITE WORD LENGTH EFFECTS 9+3

Quantization noise – truncation and rounding error-derivation for quantization noise power – Binary fixed point and floating point number representations – Comparison – input quantization error-coefficient quantization error –Product quantization error-limit cycle oscillations-dead band- Overflow error-signal scaling.

UNIT V DIGITAL SIGNAL PROCESSOR -TMS320C54X 9+3

Introduction-Architecture of C54X – 'C54X buses-Internal memory organization-Central Processing unit-Arithmetic Logic unit-Barrel Shifter-Multiplier/Adder unit-Compare, select and store unit-On-chip Peripherals-External Bus Interface - Overview of instruction set –Arithmetic instructions-Data Transfer instructions-Logical instructions

TOTAL HOURS:60 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1: Calculate the FFT of a discrete time signal.
CO2: Demonstrate various FIR filter techniques.
CO3: Demonstrate various IIR filter techniques.
CO4: Summarize finite word length effects in signal processing.
CO5: Explain the fundamentals of Digital signal processor.

TEXT BOOKS

1. John G Proakis- Dimtris G Manolakis- Digital Signal Processing Principles-Algorithms and Application- Pearson/PHI- 4th Edition- 2007-
2. S.K.Mitra- "Digital Signal Processing- A Computer based approach"- TataMcGraw-Hill- 1998- New Delhi.
3. B.Venkataramani& M-Bhaskar- Digital Signal Processor Architecture-Programming and Application- TMH 2002

REFERENCE BOOKS:

1. Allan V.Openheim, Ronald W.Sehafer& John R.Buck-"Discrete Time Signal Processing",Third edition-Pearson/Prentice Hall,2014
2. Johny R-Johnson: Introduction to Digital Signal Processing- Prentice Hall- 1984
3. Emmanuel I feachor "Digital Signal Processing: A Practical Approach", 2/E -Prentice Hall
4. Li Tan " Digital Signal Processing" Elsevier-2008

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Calculate the FFT of a discrete time signal.	3	2		1	2							1	3	1	
Co2	Demonstrate various FIR filter techniques.	3	2		1	2							1	2	1	
Co3	Demonstrate various IIR filter techniques.	3	2		1	2							1	3	1	
Co4	Summarize finite word length effects in signal processing.	2	2		1	3							1	2	1	
Co5	Explain the fundamentals of Digital signal processor.									1	3	1	2		1	2

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515ECT03 MICROPROCESSORS AND MICROCONTROLLERS L T P C
3 0 0 3

COURSE OBJECTIVES:

- Summarize the architecture and assembly language programming of microprocessors
- Defend the architecture and assembly language programming of microcontrollers
- Demonstrate the concept of interrupts and interfacing with various peripherals.
- Integrate the features of a microcontroller and its timer applications.
- Justify the architectural features of PIC with 8051 microcontroller

UNIT I 8085 MICROPROCESSOR 9

8085 Architecture – Instruction set – Addressing modes–Timing diagrams – Assembly language programming – Interrupts

UNIT II 8086 MICROPROCESSOR AND PERIPHERAL INTERFACING 9

Intel 8086 Internal Architecture – 8086 Addressing modes- Instruction set- 8086 Assembly language Programming-Interrupts - Architecture: Serial I/O (8251)- parallel I/O (8255) –Keyboard and Display controller (8279).

UNIT III 8051 MICROCONTROLLER 9

8051 Internal Architecture - Ports and circuits- External memory –instruction set – Addressing modes – Assembly language programming –-Timer / counter – Serial Communication – Interrupt .

UNIT IV 8051 REAL WORLD INTERFACING 9

8051 Interfacing: Keyboard, LCD, Stepper Motors, Interfacing to external memory and 8255.

UNIT V INTRODUCTION TO PIC16F8XX MICROCONTROLLER 9

PIC16F8XX Flash microcontrollers: Pin diagram of 16F8XX, Architectural features, I/O Ports, & Timers, Interrupts, Memory organizations

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon completion of this course, students will be able to

CO1: Recognize the basic microprocessor architecture and its concepts.
CO2: Outline the concepts of peripheral interfacing mechanisms.
CO3: Design various assembly language programming using microprocessors and microcontroller.
CO4: Extend the real world interfacing with microcontroller
CO5: Extrapolate the architecture of PIC microcontroller and its addressing modes .

TEXT BOOKS

1. Ramesh S Gaonkar, Microprocessor Architecture, Programming and application with 8085, 6th Edition, Penram International Publishing, New Delhi, 2013
2. JohnUffenbeck, The 80x86 Family, Design, Programming and Interfacing, Third Edition. Pearson Education, 2002
3. Mohammed Ali Mazidi and Janice GillispieMazidi, The 8051 Microcontroller and Embedded Systems, Pearson Education Asia, New Delhi, 2003.
4. John B.Peatman, Design with PIC Microcontrollers, Pearson Education Asia, 2002.

REFERENCE BOOKS

1. A.K. Ray and K.M.Burchandi, Intel Microprocessors Architecture Programming and Interfacing, McGraw Hill International Edition, 2000
2. Kenneth J Ayala, The 8051 Microcontroller Architecture Programming and Application, 2nd Edition, Penram International Publishers (India), New Delhi, 1996.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Recognize the basic microprocessor architecture and its concepts.	3	3		2	3							1	3	1	
Co2	Outline the concepts of	1			1		3	3	2						1	3

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Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	peripheral interfacing mechanisms.															
Co3	Design various assembly language programming using microprocessors and microcontroller.	2	3	1		2	1	1						2	1	
Co4	Extend the real world interfacing with microcontroller	3	2	3	1	1		1					1	3	1	
Co5	Extrapolate the architecture of PIC microcontroller and its addressing modes .	2	3		1	2							1		2	

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515ECT04	COMPUTER COMMUNICATIONAND NETWORKS	L T P C 3 0 0 3

Course Objectives

- Demonstrate the concept of various parameters in application layer
- Understand various protocols in transport layer like stop and wait go-back-N,TCP etc
- Discuss the various network layers and IP standards IPV4, IPV6
- Demonstrate various multiple access protocols point to point protocols and 802.11 standards
- Understand concepts in network security layers like cryptography, firewall,intrusion detection system and elements of QoS

UNIT I APPLICATION LAYER 9

Introduction-Services-client server programming - Delay, Loss and Throughput in Packet-Switched Networks-Protocol Layers and Their Service Models- Networks Under Attack- -Principles of Network Applications-The Web and HTTP-File Transfer: FTP -Electronic Mail in the Internet- DNS—The Internet's Directory Service-Peer-to-Peer Applications.

UNIT II TRANSPORT LAYER 9

Introduction and Transport Layer Services -Simple-stop and wait-Go-back N protocols -Multiplexing and Demultiplexing-Connectionless Transport: UDP-Principles of Reliable Data Transfer-Connection Oriented Transport: TCP-Principles of Congestion Control.

UNIT III THE NETWORK LAYER 9

Introduction-Virtual Circuit and Datagram Networks- Inside a Router- The Internet Protocol (IP): Forwarding and Addressing in the Internet-Routing Algorithms Routing in the Internet-Broadcast andMulticast Routing-IPV4,IPV6,ICMP-IPV6 addressing

UNIT IV DATALINK LAYER AND LOCAL AREA NETWORKS 9

Link Layer: Introduction and Services-Error-Detection and -Correction Techniques-Multiple Access Protocols-Link Layer Addressing-Ethernet-Link-Layers Switches- The Point-to-Point Protocol-Link Virtualization: A Network as a Link Layer- WiFi: 802.11 Wireless LANs.

UNIT V NETWORK SECURITY AND MANAGEMENT 9

Principles of Cryptography- Message Integrity- End-Point Authentication- Securing Email-SecuringTCP Connections: SSL-Network-Layer Security: IPsec- Securing Wireless LANs- Operational Security: Firewalls and Intrusion Detection Systems elements of QOS

Total Hours 45

Course Outcomes

Upon Completion of this course, students will be able to :

CO1: Implement the concept of various parameters in application layer

CO2: Understand various protocols in transport layer like stop and wait go-back-N,TCP etc

CO3: Configure the various network layers and IP standards IPV4, IPV6

CO4: Implement various multiple access protocols point to point protocols and 802.11 standards

CO1: Understand concepts in network security layers like cryptography, firewall,intrusion detection system and elements of QoS

Text Books

1 Andrew S.Tannenbaum-"Computer Networks"- PHI/Pearson – 4/E,2011

2 Behrouz.A.Forouzan- "Data communication and Networking"- Tata McGraw-Hill- 4/E-2013

3 James .F.Kurose & Keith W Ross "Computer Networking: A Top down approach "- Pearson education- *4 /E 2013.*

Reference Books

1 Alberto Leon Garcia, Communication Networks, 2nd Edition TMH, 2004.

2 Dougles comer 'Computer networks with Internet applications" Pearson edition 2005.

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Course Outcome	PSO1	PSO2	PSO3	PO1 a	PO2 b	PO3 c	PO4 d	PO5 e	PO6 f	PO7 g	PO8 h	PO9 i	PO 10 j	PO 11 k	PO 12 l
Co1 Implement the concept of various parameters in application layer	3	1		3	2		1	2						1	
Co2 Understand various protocols in transport layer like stop and wait go-back-N,TCP etc	2	3		3	2		3	2				1		1	
Co3 Configure the various network layers and IP standards IPV4, IPV6	3	1		3	2	3	1	1		1				1	
Co4 Implement various multiple access protocols pointto point protocols and 802.11 standards	2	3		3	2		3	2				1		1	
CoS Understand concepts in network security layers like cryptography, firewall, intrusion detection system and elements of QoS	2	3		3	2		3	2				1		1	

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515ECP07 **DIGITAL SIGNAL PROCESSING LABORATORY** **L T P C**
0 0 4 2

COURSE OBJECTIVES:

- Demonstrate the signal processing techniques in time domain using MATLAB.
- Analyze the signals in frequency domain using MATLAB.
- Design Simulink model for signal generation.
- Interpret the Audio signals using MATLAB.
- Manipulate the signal processing techniques using TMS320C5X DSP Processor

LIST OF EXPERIMENTS

USING MATLAB

1. Generation of Discrete time Signals.
2. Verification of Sampling Theorem.
3. Computation of FFT and IFFT.
4. Computation of Linear convolution .
5. Computation of Circular convolution .
6. Fast Convolution techniques.
7. Design of FIR filters (window design).
8. Design of IIR filters (Butterworth &Chebychev).
9. Record, Read and play audio signal(.WAV file).
10. Modelling pulse generator, signal generator, signal builder using MATLAB/SIMULINK.

USING TMS320C54X PROCESSOR

1. Generation of Discrete time Signals
2. Linear Convolution
3. Implementation of a FIR filter
4. Implementation of an IIR filter

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1:Implement the signal processing techniques in time domain using MATLAB
CO2:Compute the signals in frequency domain using MATLAB.
CO3:Produce Simulink model for signal generation.
CO4:Manipulate the Audio signals using MATLAB.
CO5:Analyze the signal processing techniques using TMS320C5X DSP Processor.

Course Outcome		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Co1	Implement the signal processing techniques in time domain using MATLAB	3	3		2	3							1	3	1	
Co2	Compute the signals in frequency domain using MATLAB.	3	2	3	2	1		1					1	3	1	
Co3	Produce Simulink model for signal generation.	3	2	3	1	1		1					1	3	1	
Co4	Manipulate the Audio signals using MATLAB.	3	2	3	1	1		1					1	3	1	
Co5	Analyze the signal processing techniques using TMS320C5X DSP Processor.	3	2	3	1	1		1					1	3	1	

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515ECP08	MICROPROCESSORS AND MICROCONTROLLERS LABORATORY	L T P C 0 0 4 2

COURSE OBJECTIVES:

- Develop the code in assembly language programming.
- Interpret the Assembly code using 8085, 8086 processors and 8051 controllers.
- Test the developed code using 8085, 8086 processors and 8051 controllers.
- Demonstrate the interface peripherals with microprocessor and micro controller
- Apply the interfacing in the real world applications

I. 8085 based Experiments

1. 8-bit /16 bit-Arithmetic operations using 8085.
2. Searching of a Largest and smallest number in an array using 8085.
3. Sorting of an array using 8085
4. Conversion of Hexadecimal to ASCII code using 8085
5. Design of Simple ALU using 8085.

II. 8086 based Experiments

6. 16-bit Arithmetic operations using 8086
7. Searching of a Largest and smallest number in an array using 8086
8. String manipulation using 8086.
9. Generation of Fibonacci series using 8086

III. 8051 based experiments

10. 8-bit arithmetic operations using 8051 microcontroller
11. Design of simple ALU using 8051 microcontroller.

IV. Interfacing experiments with 8085/8086/8051

12. Traffic light controller
13. Stepper motor interfacing
14. 8279 keyboard/display controller
15. ADC and DAC interfacing

COURSE OUTCOMES

Upon completion of this course, students will be able to

CO1: Generate the code for arithmetic operations in assembly language
CO2: Generalize the developed code using 8085, 8086 processors and 8051 controllers
CO3: Identify the bugs in the assembly code using 8085, 8086 processors and 8051 controllers
CO4: Reorganize the Interfacing peripherals with microprocessor and microcontroller
CO5: Propose the new design for real world applications

Course Outcome		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Co1	Generate the code for arithmetic operations in assembly language	3	2	3	2	1		1					1		2	
Co2	Generalize the developed code using 8085, 8086 processors and 8051 controllers	3	2	3	1	1		1					1		2	
Co3	Identify the bugs in the assembly code using 8085, 8086 processors and 8051 controllers	3	2	3	1	1		1					1		2	
Co4	Reorganize the Interfacing peripherals with microprocessor and microcontroller	3	2		2		1						1	3	1	
Co5	Propose the new design for real world applications.	3	2		2		1		1				1	3	1	

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515ECP09 **COMPUTER NETWORKS LABORATORY** **L T P C**
0 0 4 2

COURSE OBJECTIVES:

- Demonstrate Error Detecting Codes, IP subnet, LAN protocols
- Understand CSMA/CD Protocol, Token ring and Token Bus protocols
- Understand various protocols in transport layer like stop and wait go-back-N, TCP etc
- Demonstrate various routing algorithms like Distance vector and link state routing algorithm
- Learn NS2 simulators for Network Application.

LIST OF EXPERIMENTS

1. Implementation of Error Detecting Codes (CRC)/Error Correction Techniques
2. Implementation of IP subnet
3. Ethernet LAN protocol
4. Write A Code Simulating Ping And Trace Route Commands
5. Token bus and token ring protocols: To create scenario and study the performance of token bus and token ring protocols through .
6. Wireless LAN protocols: To create scenario and study the performance of network with CSMA / CA protocol and compare with CSMA/CD protocols.
7. Implementation and study of stop and wait protocol.
8. Implementation and study of Go-back-N and selective reject protocols.
9. Implementation of distance vector routing algorithm.
10. Implementation of Link state routing algorithm.
11. Implementation of Data encryption and decryption.
12. STUDY OF NS2 & SIMULATION OF CONGESTION CONTROL ALGORITHM USING NS2
    *Open Source Software Tools like Ethereal /Wire shark Opnet IT Guru, Network Simulator 2, GLOMOSIM. Router Simulator may be used for Simulation.

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1:Implement Error Detecting Codes, IP subnet, LAN protocols
CO2:Understand CSMA/CD Protocol, Token ring and Token Bus protocols
CO3:Understand various protocols in transport layer like stop and wait go-back-N, TCP etc
CO4:Implement various routing algorithms like Distance vector and link state routing algorithm
CO5:Simulate various algorithm in NS2 software

Course Outcome		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Co1	Implement Error Detecting Codes, IP subnet, LAN protocols	3	2		2		1		1				1	3	1	
Co2	Understand CSMA/CD Protocol, Token ring and Token Bus protocols	3	2		2		1						1	3	1	
Co3	Understand various protocols in transport layer like stop and wait go-back-N, TCP etc	3	2		2		1		1				1	3	1	
Co4	Implement various routing algorithms like Distance vector and link state routing algorithm	3	2		2		1						1	3	1	
Co5	Simulate various algorithm in NS2 software	3	2	3	1	3							1	3	1	

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615ECT02	VLSI Design	L T P C 3 0 0 3

Course Objectives

- Understand the basic CMOS circuits.
- Learn the fabrication of the CMOS using several process.
- Know the concepts of designing VHDL.
- Design the inverter and logic gates using the CMOS technology.
- Learn the basic debugging process in digital circuits.

UNIT I MOS TECHNOLOGY **9**

Chip Design Hierarchy- IC Layers –Photolithography and Pattern Transfers- Basic MOS Transistors- CMOS Fabrication – Submicron CMOS Process – Mask and Layout – CMOS Design Rules: Lambda based layout.

UNIT II MOS TRANSISTOR **9**

NMOS and PMOS transistors, Threshold voltage - Body effect - Design equations - Second ordereffects. MOS models and small signal AC characteristics - CMOS-DC and transient characteristics.

UNIT III INVERTER AND LOGIC GATES **9**

NAND and NOR Gates – Complex Logic Gates(AOI and OAI logic) –Tri state circuits – Large FETs- Transmission Gate and Pass Transistor Logic- NMOS and CMOS Inverters, Stick diagram, Inverterratio, Driving large capacitance loads, Static CMOS design, dynamic CMOS design.

UNIT IV BASICS OF TESTING AND FAULT MODELING **9**

Introduction to testing - Faults in Digital Circuits – Modeling of faults – Logical Fault Models –Fault detection – Fault Location – Fault dominance – Design for testability – Boundary scan.

UNIT V VHDL **9**

VHDL Program Structure- concurrent code – sequential code - Variables- Signals and Constants- VHDL Operators -VHDL Description of Combinational Networks: Adders ,Subtractor– VHDL Model for Multiplexer- Modeling Flip Flop using VHDL Processes —Modeling a sequential Machine.

Total Hours 45

Course Outcomes

Upon Completion of this course, students will be able to :

CO1: Discuss the different design hierarchy of the CMOS circuits.
CO2: Determine of the various characteristics of the MOS transistor.
CO3: Design the inverter and logic gates using the CMOS technology.
CO4: Perform the testing and fault modeling in any design.
CO5: Write Programs based on the VHDL structure

Text Books

1 John P Uyemura- "Chip Design for Submicron VLSI:CMOS layout and simulation" ThomsonIndia Edition-2006.

2 Neil H.E. Weste and Kamran Eshraghian, Principles of CMOS VLSI Design, Pearson EducationASIA, 2nd edition, 2000.

Reference Books

1 Eugene D.Fabricius, Introduction to VLSI Design McGraw Hill International Editions,1990

2 M.Abramovici, M.A.Breuer and A.D. Friedman, "Digital systems and Testable Design",Jaico Publishing House,2002.

3 Charles H Roth-"Digital System Design Using VHDL"- Thomson business Information India Pvt Ltd-2006 .

4 Kamran Eshraghian- Douglas A PucknellSholehEshraghian "Essentials of VLSI Circuits and Systems"- Prentice Hall of India Pvt Ltd- 2006 Wayne Wolf," Modern VLSI Design – System On Chip", PHI 2006, 3e, New Delhi.

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Course Outcome	PSO1	PSO2	PSO3	PO 1 a	PO 2 b	PO 3 c	PO 4 d	PO 5 e	PO 6 f	PO 7 g	PO 8 h	PO 9 i	PO 10 j	PO 11 k	PO 12 l
Co1 Discuss the different design hierarchy of the CMOScircuits.	3	1		3	2	3	1	3						1	
Co2 Determine of the various characteristics of the MOS transistor.	3	1		3	2	1								1	
Co3 Design the inverter and logic gates using the CMOS technology.		2										1	3	2	2
Co4 Perform the testing and fault modeling in any design.		2		3	2	3	1	3						1	
Co5 Write Programs based onthe VHDL structure		2		3	2	3	1	3						1	

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615ECT03	DIGITAL COMMUNICATION	L T P C 3 1 0 4

Course Objectives

- Discuss the process of sampling, quantization and coding that are fundamental to the digital transmission of analog signals.
- Estimate the power spectrum of the signal
- Learn baseband pulse transmission, which deals with the transmission of pulse- amplitude modulated signals in their baseband form.
- Understand the error control coding which encompasses techniques for theencoding and decoding of digital data streams for their reliable transmission over noisy channels.
- Understand the digital spread spectrum modulation.

UNIT I SAMPLING AND WAVEFORM CODING **9+3**

Sampling - Band pass sampling- PAM- PCM -Uniform and Non- Uniform Quantization- Quantizationerror- DM and Adaptive Delta Modulation-DPCM- TDM Principles-Digital Multiplexer.

UNIT II BANDLIMITED SIGNALLING **9+3**

Power Spectra of PAM signals-Matched filters- Inter Symbol Interference- Ideal Nyquist channel- Raised Cosine Channels- Correlative Coding- Eye patterns- Adaptive Equalization for Data Transmission.

UNIT III PASS BAND DATA TRANSMISSION **9+3**

Pass band Transmission Model-Correlation receivers- Generation- Detection- Signal Space diagram-Bit error probability and power spectra of -BPSK-DPSK- QPSK- QAM - FSK and MSK schemes- Performance comparisons- carrier and bit synchronization

UNIT IV ERROR CONTROL CODING **9+3**

Linear block codes- Cyclic codes- Convolutional Codes: Coding Gain and Viterbi decoding ofConvolutional Codes- Trellis coded modulation.

UNIT V SPREAD SPECTRUM SYSTEMS **9+3**

Pseudo Noise sequences- generation-principles of DSSS-Correlation properties- m-sequence and Gold sequence- FHSS- processing gain- jamming margin.

Total Hours 60

Course Outcomes

Upon Completion of this course, students will be able to :

CO1: Demonstrate of sampling and waveform coding related to digital hierarchy.
CO2: Implement the band limited signaling in the various digital transmissions.
CO3: Analyze the BER for the different digital modulations.
CO4: Apply the concept of error control coding to detect and correct the error indigital data transmission.
CO5: Understand the concept of spread spectrum modulation to obtain securecommunication.

Text Books

1 Simon Haykins- "Digital Communications"- John Wiley, 4/E- 2007.

2 H. Taub, D.L.Schilling, G. Saha- "Principles of Communication Systems"- 3/ETata McGraw HillPublishing Company- New Delhi- 2008

Reference Books

1 John.G.Proakis "Digital Communication"- McGraw Hill – 3/E - 2008.

2 B.Sklar " Digital communications"2/E Prentice Hall-2001

3 K.N.Chari., D.GaneshRao-"Digital Communications"- 2/E- Sanguine Technical Publishers- Bangalore- 2005

Course Outcome	PSO1	PSO2	PSO3	PO1 a	PO2 b	PO3 c	PO4 d	PO5 e	PO6 f	PO7 G	PO8 h	PO9 i	PO 10 j	PO 11 k	PO 12 l
Co1Demonstrate of sampling and waveform coding related to digital hierarchy.	3	1		3	2	3	1	3						1	
Co2 Implement the band limited signaling in the variousdigital transmissions.	3	1		2	3	2	1							1	
Co3 Analyze the BER for the different digital modulations.	3	1		3	2	3	1	3						1	
Co4 Apply the concept of error control coding to detect and correct the error in digital data transmission.	3	1		2	3		1							1	
Co5Understand the concept ofspread spectrum modulation toobtain secure communication.	3	1		3			2				2			1	

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615ECT04	ANTENNA AND WAVE PROPAGATION	L T P C 3 0 0 3

Course Objectives

- Provide insight of the radiation phenomenon.
- Understand the concepts of antenna arrays.
- Analyze the radiation characteristics of special antennas.
- Design and analyze the various parameters for aperture antennas.
- Understand the various types of propagation at different frequencies.

UNIT I FUNDAMENTALS OF RADIATION 9

Definition of antenna parameters – Gain, Directivity, Effective aperture, Radiation Resistance, Band width, Beam width, Input Impedance. Matching – Baluns, Polarization mismatch, Antenna noise temperature, Radiationfrom oscillating dipole, Half wave dipole. Folded dipole, Yagi array.

UNIT II APERTURE AND SLOT ANTENNAS 9

Radiation from rectangular apertures, Uniform and Tapered aperture, Horn antenna , Reflector antenna , Aperture blockage , Feeding structures , Slot antennas ,Microstrip antennas – Radiation mechanism – Application ,Numerical tool for antenna analysis

UNIT III ANTENNA ARRAYS 9

N element linear array, Pattern multiplication, Broadside and End fire array – Concept of Phased arrays,Adaptive array, Basic principle of antenna Synthesis-Binomial array

UNIT IV SPECIAL ANTENNAS 9

Principle of frequency independent antennas –Spiral antenna, Helical antenna, Log periodic. Modern antennas- Reconfigurable antenna, Active antenna, Dielectric antennas, Electronic band gap structure and applications, Antenna Measurements-Test Ranges, Measurement of Gain, Radiation pattern, Polarization, VSWR

UNIT V PROPAGATION OF RADIO WAVES 9

Modes of propagation , Structure of atmosphere , Ground wave propagation , Tropospheric propagation , Duct propagation, Troposcatter propagation , Flat earth and Curved earth concept, Sky wave propagation – Virtualheight, Critical frequency , Maximum Usable Frequency – Skip distance, Fading , Multi hop propagation

Total Hours 45

Course Outcomes

Upon Completion of this course, students will be able to :

CO1: Identify the various antenna modules for Radio frequency communicationsystems.

CO2: Identify the various antenna arrays patterns

CO3: Compute the various radiation patterns for special antennas.

CO4: Utilize the concept of aperture and slot antennas in desired application

CO5: Explain the various types of wave propagation.

Text Books

1 John D Kraus," Antennas for all Applications", 3rd Edition, Mc Graw Hill, 2005.

Reference Books

1 Edward C.Jordan and Keith G.Balmain" Electromagnetic Waves and Radiating Systems" PrenticeHall of India, 2006

2 R.E.Collin,"Antennas and Radiowave Propagation", Mc Graw Hill 1985.

3 Constantine.A.Balanis "Antenna Theory Analysis and Design", Wiley Student Edition, 2006.

4 Rajeswari Chatterjee, "Antenna Theory and Practice" Revised Second Edition New Age International Publishers, 2006.

5 S. Drabowitch, "Modern Antennas" Second Edition, Springer Publications, 2007.

6 Robert S.Elliott "Antenna Theory and Design" Wiley Student Edition, 2006.

7 H.Sizun "Radio Wave Propagation for Telecommunication Applications", First Indian Reprint,Springer Publications, 2007.

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Course Outcome	PSO1	PSO2	PSO3	PO1 a	PO2 b	PO3 c	PO4 d	PO5 e	PO6 f	PO7 g	PO8 h	PO9 i	PO 10 j	PO 11 k	PO 12 l
Co1Identify the various antenna modules for Radiofrequency communication systems.	3	1		3	2	1								1	
Co2 Identify the various antenna arrays patterns	3	1		2	3	2	1							1	
Co3 Compute the various radiation patterns for special antennas.	3	1		3	2	1								1	
Co4 Utilize the concept of aperture and slot antennas in desired application	3	1		3	2	1								1	
Co5Explain the various typesof wave propagation.	3	1		3	2	1								1	

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615ECP08	VLSI Design Laboratory	L T P C 0 0 4 2

Course Objectives

- Develop VHDL programs for various sequential and combinational logiccircuits.
- Design the CMOS circuits using SPICE.

LIST OF EXPERIMENTS

I- Design and simulation of Combinational Logic Circuit using VHDL

1. Adder,subtractor
2. Multiplexer and Demultiplexer
3. Encoder and Decoder
4. Multiplier

II- Design and simulation of Sequential logic circuit using VHDL

5. Flip Flops
6. Counter
7. Shift registers
8. Frequency Divider

III- CMOS Circuit design using SPICE (DC and Transient Analysis)

9. CMOS Inverter
10. CMOS NAND and NOR Gates
11. CMOS D Latch

IV- FPGA Implementation

12. 4 bit Adder, 4 Bit Multiplier.
13. Real Time Clock

Course Outcomes

Upon Completion of this course, students will be able to :

CO1: Design and simulate various sequential and combinational logic circuits withVHDL programs.

CO2: Design and implement the different adders and multipliers using FPGA kit.

CO3: Design CMOS circuits for the DC and transient analysis.

Course Outcome	PSO1	PSO2	PSO3	PO1 a	PO2 b	PO3 c	PO 4 d	PO 5 e	PO 6 f	PO 7 g	PO8 h	PO 9 i	PO 10 j	PO 11 k	PO 12 l
Co1 Design and simulate various sequential and combinational logic circuitswith VHDL programs.		3		2	3		1	2						1	
Co2 Design and implement the different adders and multipliers using FPGA kit.	3	1		3	2		1	2						1	
Co3 Design CMOS circuits forthe DC and transient analysis.												1	3	2	1

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615ECP09 **Analog and Digital CommunicationSystems Laboratory** **L T P C**
0 0 4 2

Course Objectives

- Know about the difference between modulation and demodulation techniquespractically.
- Design and implementing the phase locked loop circuits.
- Study the characteristics of the different detectors in analog and digitalcommunication techniques.

LIST OF EXPERIMENTS

1. Amplitude Modulation and demodulation
2. Frequency Modulation and FSK Generation
3. Balanced modulator
4. Pre-emphasis & de-emphasis
5. Phase locked loop and applications
6. PWM Generation and detection
7. AM detector and AGC Characteristics
8. FM detector
9. PAM and verification of sampling theorem
10. Pulse Code Modulation Encoder and Decoder
11. Delta modulation and demodulation
12. Digital Modulation Techniques

Course Outcomes

Upon Completion of this course, students will be able to :

CO1: Analyze the PLL characteristics and its applications.

CO2: Understand the difference between the modulation and demodulationtechniques.

CO3: Implement various detection process of analog and digital communication.

Course Outcome	PSO1	PSO2	PSO3	PO1 a	PO2 b	PO3 c	PO4 d	PO5 e	PO6 f	PO7 g	PO8 h	PO9 i	PO 10 j	PO 11 k	PO 12 l
Co1 Analyze the PLL characteristics and its applications.												1	3	2	1
Co2 Understand the difference between the modulation and demodulation techniques.												1	3	2	1
Co3 Implement various detection process of analog and digital communication.	3	1		3	2	3	1	1		1				1	

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615ECE01 **DIGITAL IMAGE PROCESSING** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- Understand the fundamentals of image processing
- Understand the basic image transforms.
- Compare different Image enhancement and restoration techniques
- Describe the various image segmentation and representation process
- Understand the Image compression process

UNIT I DIGITAL IMAGE FUNDAMENTALS **9**

Elements of digital image processing systems- Elements of visual perception- psycho visual model-brightness- contrast- hue- saturation- mach band effect-Color Image fundamentals- RGB- HSI models- Image sampling- Quantization- dither- Two dimensional mathematical preliminaries

UNIT II IMAGE TRANSFORMS **9**

1D DFT- 2D transforms – DFT- DCT- Discrete Sine, Walsh- Hadamard , Slant , Haar Wavelet Transform

UNIT III IMAGE ENHANCEMENT AND RESTORATION **9**

Spatial domain enhancement: gray level transformations - Histogram modification and specification techniques- Image averaging- Directional Smoothing- Median- Geometric mean- Harmonic mean- Contra harmonic and Yp mean filters- Homomorphic filtering- Color image enhancement. Image Restoration – degradation model- Unconstrained and Constrained restoration- Inverse filtering: Removal of blur caused by uniform linear motion- Wiener filtering- Geometric transformations: Saptial transformations- Gray-Level interpolation .

UNIT IV IMAGE SEGMENTATION AND REPRESENTATION **9**

Point- line and edge detection- Edge linking-Hough Transform- Region based segmentation: Region splitting and merging. Image representation: chain codes – polygonal approximations – signatures – boundary segments – skeletons.

UNIT V IMAGE COMPRESSION **9**

Need for data compression- Error free compression: variable length coding, bit plane coding, LZW coding. Lossy compression: Transform coding, wavelet coding. Compression standards: binary image compression standard, still image compression standards, video compression standards.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1: Compute the mathematical transforms for images.
CO2: Analyze Image by designing spatial and frequency domain filters.
CO3: Describe the concepts of image segmentation and pattern recognition and to develop an object recognition system.
CO4: List the various image segmentation and representation process
CO5: Explain the Image compression process

TEXT BOOKS

1. Rafael C- Gonzalez- Richard E-Woods- 'Digital Image Processing'- Pearson Education- Inc-- Third Edition- 2015
2. Anil K- Jain- 'Fundamentals of Digital Image Processing'- Pearson/Prentice Hall of India- 2002

REFERENCE BOOKS

1. Dr.S.Jayaraman, Digital Image Processing TMH New Delhi, 2009
2. David Salomon Data Compression – The Complete Reference- Springer Verlag New York Inc-- 2nd Edition- 2001

3. William K-Pratt- 'Digital Image Processing'- John Wiley- NewYork- 2002.
4. Kenneth R.Castleman-"Digital Image Processing"-Pearson-2003.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
Co1	Compute the mathematical transforms for images.	3	2	3	2	2	1	1	1	1	1	2	1	3	2	1
Co2	Analyze Image by designing spatial and frequency domain filters.	3	2	3	1	3							1	3	1	
Co3	Describe the concepts of image segmentation and pattern recognition and to develop an object recognition system.	2	3	2	1								1	3	1	
Co4	List the various image segmentation and representation process	2	3	2	1								1	3	1	
Co5	Explain the Image compression process	3	2	1									1	3	1	

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615ECE03	DIGITAL SYSTEM DESIGN USING VHDL	L T P C 3 0 0 3

COURSE OBJECTIVES

- Understand the architecture and programming of Programmable Logic devices
- Implement and realize the SM charts.
- Design and program FPGA for digital system
- Design and program RISC microprocessor
- Develop program for Digital system design using VHDL

UNIT I Introduction To Programmable Logic Devices **9**

Programmable Logic Devices, Simple Programmable Logic Devices, Complex Programmable Logic Devices, Field Programmable Gate Arrays

UNIT II State Machine Charts **9**

State Machine Charts, Derivation of SM Charts, Realization of SM Charts

UNIT III Designing With Field Programmable Gate Array **9**

Function Implementation in FPGAs and Shannon Decomposition, Carry and Cascade Chains in FPGAs, Dedicated memories and Multipliers in FPGA, Cost of Programmability, FPGA Capacity: Maximum Gates vs. Usable Gates, Design translation, Mapping , Placement and Routing

UNIT IV Design of RISC Microprocessor **9**

RISC Philosophy, MIPS ISA, MIPS Instruction Encoding, implementation of MIPS Subset, VHDL model-Memory and Register

UNIT V VHDL **9**

VHDL function and Procedures, Attributes and overloaded Operators, Multivalued Logic and Signal resolution, IEEE 9-valued Logic System, SRAM model using IEEE, Model for SRAM ready write system

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Write programs for programmable Logic devices
CO2: Implement and realization of SM charts
CO3: Implement and realize digital design in FPGA
CO4: Write program using RISC
CO5: Write Programs in VHDL

TEXT BOOKS

1. Principle of Digital System Design Using VHDL by Roth and John, Cengagelearning,Third edition,2016
2. "An Engineering Approach to Digital Design" by William I. Fletcher, PHI 10th Edition,2007

REFERENCE BOOKS

1. "Digital Design Principles and Practices" by John F. Wakerly, Person Publication 4thEdition,2009
2. "Fundamentals of Digital Logic with VHDL Design" by Stephen Brown and Zvonko, McGraw-Hill 3rdEdition,2009
3. ZainalabedinNavabi, VHDL, analysis and modeling of digital systems, McGraw-HillThird Edition 2011

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Course Outcome		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Co1	Write programs for programmable Logic devices	3	2	3	1	3							1	3	1	
Co2	Implement and realization of SM charts	3	2	1									1	3	1	
Co3	Implement and realize digital design in FPGA	3	2	1									1	3	1	
Co4	Write program using RISC						3	2	3	2		3		3	1	
Co5	Write Programs in VHDL	3	2	1									1	3	1	

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615ECE04 **INFORMATION THEORY AND CODING** L T P C
3 0 0 3

COURSE OBJECTIVES

- Understand the Concept of Information Entropy,
- Understand the various Source coding Technique
- Understand the various compression technique like Huffman coding, Tagged Image file
- Understand various data and voice coding methods like DPCM, LPC etc.,
- Understand the concept of Channel Capacity and Error control codes

UNIT I INFORMATION ENTROPY FUNDAMENTALS 9

Uncertainty, Information and Entropy – Source coding Theorem – Huffman coding –Shannon Fano coding – Discrete Memoryless channels – channel capacity – channel coding Theorem – Channel capacity Theorem

UNIT II SOURCE CODING 9

Encoding of the source output, Shannon's encoding algorithm. Communication Channels, Discrete communication channels, Continuous channels

UNIT III COMPRESSION TECHNIQUES 9

Principles – Text compression – Static Huffman Coding – Dynamic Huffman coding – Arithmetic coding – Image Compression – Graphics Interchange format – Tagged Image File Format – Digitized documents – Introduction to JPEG standards

UNIT IV DATA AND VOICE CODING 9

Differential Pulse code Modulation – Adaptive Differential Pulse Code Modulation – Adaptive subband coding – Delta Modulation – Adaptive Delta Modulation – Coding of speech signal at low bit rates (Vocoders, LPC).

UNIT V ERROR CONTROL CODES 9

Linear Block codes – Syndrome Decoding – Mianimum distance consideration – cyclic codes – Generator Polynomial – Parity check polynomial – Encoder for cyclic codes – calculation of syndrome – Convolutional codes.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Acquire Knowledge in Information entropy, channel capacity
CO2: Apply various source coding techniques
CO3: Implement various compression techniques in relevant application
CO4: Acquire Knowledge in Error control codes
CO5: Apply various decoding techniques in Block codes and Convolutional codes

TEXT BOOKS

1. Digital and analog communication systems, K. Sam Shanmugam, John Wiley,2006
2. Digital communication, Simon Haykin, John Wiley, 2008

REFERENCE BOOKS

1. ITC and Cryptography, Ranjan Bose, TMH, II edition, 2007
2. Fred Halsall, "Multimedia Communications, Applications Networks Protocols and Standards", Pearson Education, Asia 2002; Chapters: 3,45

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Course Outcome		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Co1	Acquire Knowledge in Information entropy, channel capacity	3	2	3	1	3							1	3	1	
Co2	Apply various source coding techniques	3	2	1									1	3	1	
Co3	Implement various compression techniques in relevant application	3	2	1									1	3	1	
Co4	Acquire Knowledge in Error control codes	3	2	1									1	3	1	
Co5	Apply various decoding techniques in Block codes and Convolutional codes	3	2	1									1	3	1	

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715ECT01 **RF SYSTEM DESIGN** **L T P C**
3 0 0 3

Course Objectives

- Recognize the importance and issues in the design of RF systems.
- Design the filter operation in RF applications.
- Identify the operational characteristics of Active RF Components.
- Demonstrate the basic model, characteristic and configuration of RF Amplifiers.
- Design Oscillators and Mixers in RF Applications.

UNIT I RF ISSUES **9**

Importance of RF design- Electromagnetic spectrum, RF behavior of passive components, chip components and circuit board considerations, scattering parameters, smith chart and applications.

UNIT II RF FILTER DESIGN **9**

Overview, Basic resonator and filter configuration, special filter realizations, smith chart based filter design,coupled filter.

UNIT III ACTIVE RF COMPONENTS AND APPLICATIONS **9**

RF diodes, BJT, RF FET'S, High electron mobility transistors, matching and biasing networks- impedance matching using discrete components, microstrip line matching networks, amplifier classes of operation And biasing networks.

UNIT IV RF AMPLIFIER DESIGNS **9**

Characteristics, amplifier power relations, stability considerations, constant gain circles, constant VSWR circles, low noise circles broadband, high power and multistage amplifiers.

UNIT V OSCILLATORS, MIXERS & APPLICATIONS **9**

Basic oscillator model, High Frequency oscillator configuration, basic characteristic of mixers, wireless synthesizers, phase locked loops, RF directional couplers, detector and demodulator circuits.

Total Hours 45

Course Outcomes

Upon Completion of this course, students will be able to :

CO1: Describe the various passive and active components for radio frequency circuit
CO2: Analyze RF filters based on smith chart.
CO3: Analyze the biasing methods for RF amplifiers.
CO4: Compare the various RF amplifiers and their performance.
CO5: Design oscillators and mixers for various applications.

Text Books

1 Reinhold Ludwig,Gene Bogdanov, RF Circuit Design, Theory and Applications, Pearson Asia Education , Second Edition, 2009.
2 Joseph. J. Carr, Secrets of RF Circuit Design , McGraw Hill Publishers, Third Edition,2000.
3 Mathew M. Radmanesh, Radio Frequency & Microwave Electronics, Pearson Education Asia, SecondEdition, 2002.

Reference Books

1 Ulrich L. Rohde and David P. New Kirk, RF / Microwave Circuit Design, John Wiley & Sons USA, 2000.
2 Roland E. Best, Phase – Locked Loops: Design, simulation and applications, McGraw Hill Publishers, Fifth Edition, 2003

Course Outcome	PSO1	PSO2	PSO3	PO1 a	PO2 b	PO3 C	PO 4 d	PO 5 e	PO 6 f	PO 7 g	PO8 h	PO 9 i	PO 10 j	PO 11 k	PO 12 l
Co1Describe the various passive and active componentsfor radio frequency circuit	2	1		2	2		1	3						1	
Co2 Analyze RF filters basedon smith chart.	3	1		3	2		1	2						1	
Co3 Analyze the biasing methods for RF amplifiers.	3	1		3	2		1	2						1	
Co4 Compare the various RF amplifiers and their performance.	2	3		3	2		3	2				1		1	
Co5 Design oscillators and mixers for various applications.	3	1		3	2	3	1	1		1				1	

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715ECT02	OPTICAL COMMUNICATION	L T P C
		3 0 0 3

COURSE OBJECTIVES

- Define the basic concepts of the optical transmission links.
- Analyze the different losses and degradation of the signals in the optical transmission.
- Generalize about the different laser sources and their effects.
- Identify the specification and operation of various optical receivers.
- Discuss about digital transmission systems with optical fibers

UNIT I OPTICAL FIBERS – STRUCTURE 9

Evolution of Fiber Optic Systems – Elements of an Optical fiber Transmission link – Basic laws and definitions – ray optics – Optical fiber modes and configurations – Mode theory of circular waveguides – Overview of modes – Key modal concepts – Linearly Polarized waves – Single Mode Fibers – Graded Index Fiber Structure- design optimization of SM fibers – RI profile and cut – off wavelength.

UNIT II SIGNAL DEGRADATION IN OPTICAL FIBERS 9

Attenuation – Signal distortion in optical wave guides – Information capacity determination – Group delay – material dispersion – Wave Guide dispersion –Signal distortion in single mode fibers – Polarization mode dispersion –Intermodal dispersion – Pulse broadening in GI fibers – Mode Coupling – Principles of fiber nonlinearities.

UNIT III OPTICAL TRANSMITTERS 9

Materials of optical sources - LED's – Semiconductor Laser Diodes – longitudinal modes, gain and index-guiding – power – current characteristics – spectral behavior – longitudinal mode control and tunability – noise – direct and external modulation – Laser Sources and transmitters – transmitters for free space communication.

UNIT IV OPTICAL RECEIVERS 9

Principles of Optical detection – Spectral responsisvity - PIN Photo detector – Schottky-Barrier Photodiodes - Avalanche Photodiodes –- Phototransistors -Fundamental Receiver operation – Preamplifier types – Receiver noise – Signal to noise ratio (SNR) and Bit Error Rate (BER)- Principle of coherent detection.

UNIT V DIGITAL TRANSMISSION SYSTEMS 9

Point to point link systems considerations – Link Power budget – Rise time budget – Noise effects on system performance – Operational principles of WDM– Solitons – EDFA – Basic concepts of SONET/SDH.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Predict the different characteristics of the optical links.
CO2: Detect signal loss while designing the transceivers.
CO3: Summarize the optical sources and detectors with their effects.
CO4: Justify the suitable receivers and couplers in the transceiver design.
CO5: Design digital transmission systems with optical fibers.

TEXT BOOKS:

1. P Chakrabarti, "Optical Fiber Communication", McGraw Hill Education (India)Private
2. Limited, 2016 GredKeiser,"Optical Fiber Communication", McGraw Hill Education (India) Private
3. GredKeiser,"Optical Fiber Communication", McGraw Hill Education (India) Private Limited. Fifth Edition, Reprint 2013

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REFERENCE BOOKS

1. John M.Senior-"Optical Fiber communications –principles and practice"-Third edition,Pearson/Prentice Hall. 2012
2. Palais " Fiber optic communications " pearson 2005-5th Edition
3. Govind P. Agrawal, "Fiber-optic communication systems", third edition, John Wiley & sons, 2004.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Predict the different characteristics of the optical links.	3	2		1	2							1	3	1	
Co2	Detect signal loss while designing the transceivers.	2	2		1	3							1	2	1	
Co3	Summarize the optical sources and detectors with their effects.									1	3	1	2		1	2
Co4	Justify the suitable receivers and couplers in the transceiver design.	3	3		2	3							1	3	1	
Co5	Design digital transmission systems with optical fibers.	1			1		3	3	2						1	3

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715ECT03	MICROWAVE ENGINEERING	L T P C
		3 1 0 4

COURSE OBJECTIVES

- Analyze the effect of S-Matrix for E- Plane, H-Plane, Directional Coupler
- Learn the specification and operations of the various microwave tubes.
- Learn the various parameter measurements in microwaves.
- Know about the different types of microwave semiconductor devices.
- understand microwave strip lines and their effects

UNIT I MICROWAVE NETWORK CHARACTERIZATION AND PASSIVECOMPONENTS **9+3**

Circuit and S parameter representation of N ports- Reciprocity Theorem- Lossless networks and unitary conditions- ABCD parameters-Cascaded networks- Effect of changing the reference planes in the S matrix- S- matrix of Directional Coupler- Microwave T junction: E- Plane Tee, H-Plane Tee, Magic Tee and rat race coupler-Qualitative discussion on: Waveguide Corners- Bends- Twists- Matched loadsand movable shorts.

UNIT II MICROWAVE TUBES **9+3**

Transit time effect- Velocity modulation –current modulation-bunching - Reflex Klystron- Slow-Wave structures – Traveling-Wave Tubes Amplifier- Convection Current- Axial Electric Field- Wave Modes- Bandwidth, Power and Gain Considerations – cross field device –Magnetron-power and frequency considerations.

UNIT III MICROWAVE MEASUREMENTS **9+3**

Slotted line VSWR measurement- impedance measurement- insertion loss and attenuation measurements- measurement of scattering parameters – Return loss measurement using directional coupler-Introduction to vector network analyzer and its uses- return loss and insertion loss.

UNIT IV MICROWAVE SEMICONDUCTOR DEVICES **9+3**

Gunn-Effect – Gunn Diode- Modes of Operation-Amplification- Microwave Generation- Read Diode- Physical Description- Avalanche Multiplication- IMPATT Diodes- TRAPATT Diode- BARITT Diode-Tunnel diodes- Principles of Operation- Physical Structures- Parametric Amplifiers -Nonlinear Reactance and Manley – Rowe Power Relations.

UNIT V MICROSTRIP LINES **9+3**

Introduction- MICs -Microstrip Lines- Derivation of Characteristic Impedance of Microstrip Lines using Quasi Static analysis- Losses in Microstrip Lines- Quality Factor Q of Microstrip Lines- Substrate materials-surface wave excitation- Parallel Strip Lines-Characteristic Impedance- Attenuation Losses- Coplanar Strip Lines- Shielded Strip Lines- Problems- Microstrip based broadband matching networks. Applications of microstrip line.

Total Hours **60**

Course Outcomes

Upon Completion of this course, students will be able to :

CO1: Understand the effects of S- matrix in microwave networks.
CO2: Acquired knowledge in klystron amplifiers and helix traveling wave tubes.
CO3: Determination of impedance, losses and frequency in microwave networks.
CO4: Ability to understand the operation and structure of IMPATT,TRAPATT,BARITT.
CO5: Acquired knowledge in various performance metrics of Microstrip line.

Text Books

1 Samuel Y-LIAO : Microwave Devices and Circuits – Pearson/Prentice Hall ofIndia – 3rd Edition (2003) .
2 Annapurna Das and Sisir K-Das: Microwave Engineering – Tata McGraw-Hill(2000).

Reference Books

1 R-E- Collin : Foundations for Microwave Engg- – IEEE Press Second Edition, 2002.
2 David M-POZAR : Microwave Engg- – John Wiley & Sons Second Edition, 2003
3 Rizzi " Microwave Engineering-passive circuits " PHI 2007
4 G. S. Raghuvanshi and K. Satya Prasad, Microwave Engineering – Cengage Learning, 2012.
5 Ahmad Shahid Khan, Microwave Engineering: Concepts and Fundamentals, CRC Press, 2014

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Course Outcome	PSO1	PSO2	PSO3	PO1 a	PO2 b	PO3 c	PO4 d	PO5 e	PO6 f	PO 7 g	PO8 h	PO9 i	PO 10 j	PO 11 k	PO 12 l
Co1 Understand the effects ofS-matrix in microwave networks.	3	1		2	3		1	2						1	
Co2 Acquired knowledge in klystron amplifiers and helix traveling wave tubes.	2	1		2	3	1		2	1	1					
Co3 Determination of impedance, losses and frequency in microwave networks.	3	1		2	3		1	2						1	
Co4 Ability to understand the operation and structure of IMPATT, TRAPATT, BARITT.	3	1		3	2	3	1	1		1				1	
Co5 Acquired knowledge in various performance metrics of Microstrip line.	2	3		3	2		3	2				1		1	

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715ECT04	EMBEDDED SYSTEMS	L T P C
		3 0 0 3

COURSE OBJECTIVES

- Point out the basic concepts and architecture of the embedded systems.
- Understand the various concepts of the RTOS and OS.-
- Obtain the knowledge on programming for embedded system
- Analyze various networking protocols.
- Apply the various designs in real time applications.

UNIT I EMBEDDED ARCHITECTURE 9

Embedded Computers, Characteristics of Embedded Computing Applications, Challenges in Embedded System Design, Embedded System Design Process - Requirements, Specification, Architectural Design, Designing Hardware and Software Components, System Integration.

UNIT II REAL-TIME OPERATING SYSTEM CONCEPTS 9

Desk Top OS versus RTOS - Architecture of the Kernel-task and task scheduler-Interrupt Service Routines- Semaphores-Mutex-Mailboxes-Message Queues-Event Registers-Pipes-Signals- Timers-Memory Management – Priority Inversion Problem

UNIT III PROGRAMMING FOR EMBEDDED SYSTEMS 9

Embedded Program – Role of Infinite loop – compiling, linking and locating –downloading and debugging – Emulators and Simulators processor - Overview of Embedded C - Programming and Assembly – Register usage conventions - procedure call and return - parameter passing – retrieving parameters - temporary variables

UNIT IV NETWORKS 9

Distributed Embedded Architecture - Hardware and Software Architectures, Networks for embedded systems- I^2C, CAN Bus, SHARC link ports, Ethernet, Internet. Design Example: Elevator Controller.

UNIT V CASE STUDY 9

Data Compressor-Alarm clock-Cell phones-Audio player-Software Modem-Digital still camera-Telephone answering machine-Engine control unit

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Identify the basic concepts and architecture of the embedded systems.
CO2: Summarize the various concepts of the RTOS and OS.
CO3: Write program for embedded system
CO4: Gain knowledge on various communication protocols.
CO5: Perform the design in various concepts for real time application models

TEXT BOOKS

1. Wayne Wolf, "Computers as Components - Principles of Embedded Computing System Design",
2. Morgan Kaufman Publishers, First Indian Reprint, 2001. Marilyn Wolf, "Computers as Components - Principles of Embedded Computing System Design",
3. Marilyn Wolf, "Computers as Components - Principles of Embedded Computing System Design",

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4. Morgan Kaufman Publishers, Third edition, 2012. K.V.K.K.Prasad ,"Embedded /Real-Time Systems: Concepts, Design and programming" Dreamtech, Wiley 2003.
5. K.V.K.K.Prasad ,"Embedded /Real-Time Systems: Concepts, Design and programming" Dreamtech, Wiley 2003.

REFERENCE BOOKS

1. Raj Kamal "Embedded Systems Architecture Programming and Design" 2nd Edition TMH,2008
2. David E Simon "An Embedded Software Primer" Pearson Education 2003
3. Daniel.W. Lewis, "Fundamentals of Embedded Software" Pearson Education- 2001
4. Peatman "Designing with PIC Micro Controller", Pearson 2003.
5. Introduction to Embedded system – ShibuK.V.McGraw Hill.
6. Michael Barr, "Programming Embedded systems in C & C++" Oreily, 2003.

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Identify the basic concepts and architecture of the embedded systems.	2	3		1	2							1	3	1	
Co2	Summarize the various concepts of the RTOS and OS.	2	3		1	2							1	3	1	
Co3	Write program for embedded system	2	3		1	2							1	3	1	
Co4	Gain knowledge on various communication protocols.	2	3		1	2							1	3	1	
Co5	Perform the design in various concepts for real time application models.	3	3		2	3							1	3	1	

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715ECP07 **OPTICAL AND MICROWAVE LABORATORY** **L T P C**
0 0 4 2

COURSE OBJECTIVES

- Recognize the behavior of microwave components
- Predict microwave measurement procedures
- Compute the working principle of optical sources and components
- Design The WDM network and chromatic dispersion
- Determine BER and Eye pattern measurements

LIST OF EXPERIMENTS

Microwave Lab Experiments:

1. Characteristics of Reflex Klystron and Gunn diode Oscillator
2. Study of Power Distribution in directional coupler.
3. Study of power distribution in E / H -Plane Tee, Magic Tee.
4. VSWR Measurements – Determination of terminated load and impedance using Smith chart.
5. Radiation Pattern, Gain, Directivity of Horn antenna.
6. Determination of guide wavelength, frequency measurement.
7. Paraboloids design using MATLAB/Ansoft HFSS

Optical Experiments:

1. Measurement of Numerical Aperture and Coupling (Angular and Lateral) in Optical Fiber.
2. DC Characteristics of LED and LASER Diode.
3. Analog/Digital transmission through optical fiber link.
3. Data Communication and Wave length Division multiplexing and de-Multiplexing using Single mode Fiber Optic System.
4. Attenuation and Chromatic dispersion Measurement in Single Mode Optical Glass Fiber.
5. BER and Eye pattern measurement.

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Analyze S parameter and VSWR measurements of microwave components
CO2: Identify the Radiation pattern of Horn and reflector antenna
CO3: Outline basic of light propagation and mode characteristics through optical Fiber
CO4: Estimate the operations of optical networks
CO5: Demonstrate the microwave work bench with various components

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Analyze S parameter and VSWR measurements of microwave components	3	2	3	1	1		1					1	3	1	
Co2	Identify the Radiation pattern of Horn and reflector antenna	3	2		2	3				1			1	3	1	
Co3	Outline basic of light propagation and mode characteristics through optical Fiber	3	2	3	1	1		1					1	3	1	

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Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co4	Estimate the operations of optical networks	3	2	3	1	1		1					1	3	1	
Co5	Demonstrate the microwave work bench with various components	3	2	3	1	1		1					1	3	1	

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715ECP08 **ELECTRONIC SYSTEM DESIGN LABORATORY** **L T P C**
0 0 4 2

COURSE OBJECTIVES

- Illustrate the design of power supply circuits using SCR and timer circuits
- Infer various transducers interfacing with microprocessor
- Generalize the modulation schemes using MATLAB
- Develop DTMF generation & detection using MATLAB
- Draw PCB Layout design using CAD.

LIST OF EXPERIMENTS

1. Design of AC/DC voltage regulator using SCR
2. Design of Process Control Timer
3. Microprocessor based system design along with suitable signal conditioners for the measurement using
    a. LVDT
    b. Strain gauge and Pressure Transducer
    c. Photocell / LDR
    d. Temperature measurement using RTD- Thermo couples
4. Data acquisition and storage of signals through Serial / Parallel port to PC
5. PC based data acquisition using add-on (PCI) card or USB compatible card
6. DC motor speed control using digital logic circuits/Microprocessor/PC
7. Simulation Experiments (using MATLAB)
    a. DTMF generation & detection
    b. Multi-rate Processing
    c. Echo Cancellation
    d. Error Detection coding
    e. Modulation and Demodulation
8. PCB Layout design using CAD

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Recall the concept of regulator, SCR and timer circuit designs.
CO2: Analyze various transducers interfacing with microprocessor.
CO3: Devise modulation schemes using MATLAB
CO4: Extrapolate DTMF generation & detection using MATLAB
CO5: Demonstrate PCB Layout design using CAD

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Recall the concept of regulator, SCR and timer circuit designs.	3	2		2	3				1			1		2	
Co2	Analyze various transducers interfacing with microprocessor.	3	2	3	1	1		1					1		2	
Co3	Devise modulation schemes using MATLAB	3	2	3	1	1		1					1		2	

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Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co4	Extrapolate DTMF generation & detection using MATLAB	3	3		2	3							1	3	1	
Co5	Demonstrate PCB Layout design using CAD	3	2	3	2	1		1					1	3	1	

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715ECE01	Engineering Ethics And Human Values	L T P C
		3 0 0 3

Course Objectives

- Distinguish the morality, integrity, honesty and spirituality.
- Explain the various theory which portray about the engineering ethics.
- Illustrate the industrial standard and responsibility of engineers.
- Discover the safety and rights of human in the working place.
- Drive the professional to aware of the global issues in the technological society

UNIT I HUMAN VALUES 9

Morals- Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self- Confidence – Character – Spirituality.

UNIT II ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry – moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self- interest - customs and religion - uses of ethical theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation - engineers as responsible experimenters - codes of ethics –industrial standards- a balancedoutlook on law - the challenger case study

UNIT IV SAFETY- RESPONSIBILITIES AND RIGHTS 9

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island and chernobyl case studies- Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest – occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

UNIT V GLOBAL ISSUES 9

Multinational corporations -Corporate Social responsibility- Environmental ethics - computer ethics – weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership- sample code of Ethics like ASME- ASCE- IE- E-E- Institution of Engineers (IEI) India- Institution of Electronics andTelecommunication engineers(IETE) India-

Total Hours 45

Course Outcomes

Upon Completion of this course, students will be able to :

CO1: Extrapolate and make awareness on the morality, integrity, honesty and spirituality.
CO2: Judgement and assistance based on the ethical theory to tackle the moral issues.
CO3: Professional reputation is witnessed due to the balanced outlook on law.
CO4: Develop safety and responsibilities for the development of the employee.
CO5: Drive to be a moral leader with the analysis of the global issues in the engineering society.

Text Books

1 Mike Martin and Roland Schinzinger- "Ethics in Engineering"- Tata McGraw-Hill- - 1996-3 e
2 Govindarajan M- Natarajan S- Senthil Kumar V- S- "Engineering Ethics"- Prentice Hall of India- New Delhi- 2004.

Reference Books

1 R-S Nagarazan -"A textbook on Professional Ethics and Human Values" New Age International Publishers- New Delhi2006.
2 Charles D- Fleddermann- "Engineering Ethics"- Pearson Education / Prentice Hall- New Jersey- 2004 (Indian Reprint).
3 Charles E Harris- Michael S- Protchard and Michael J Rabins- "Engineering Ethics – Concepts and Cases"- Wadsworth Thompson Learning- United States- 2000 (Indian Reprint now available).
4 John R Boatright- "Ethics and the Conduct of Business"- Pearson Education- New Delhi- 2003.

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Course Outcome	PSO1	PSO2	PSO3	PO1 a	PO2 b	PO3 c	PO4 d	PO5 e	PO6 f	PO7 g	PO8 h	PO9 i	PO 10 j	PO 11 k	PO 12 l
Co1 Extrapolate and make awareness on the morality, integrity, honesty and spirituality.		2		3	2	3	1	1		1				1	
Co2 Judgement and assistancebased on the ethical theory to tackle the moral issues.		2		3	2	3	1	1		1				1	
Co3 Professional reputation is witnessed due to the balanced outlook on law.		2		3	2		2	3				1		1	
Co4 Develop safety and responsibilities for the development of the employee.		2		3	2	3	1	1		1				1	
Co5 Drive to be a moral leaderwith the analysis of the global issues in the engineering society.		2		3	2	3	1	1		1				1	

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715ECE02	PRINCIPLES OF MANAGEMENT	L T P C
		3 0 0 3

Course Objectives

- Discuss the historical development of management and administration.
- Interpret the responsibility of the planning and decision making.
- Design the structure and process of the functional area of organization
- Generalize the responsibility of the leadership in organization.
- Specify the controlling strategies for the global issues.

UNIT I FOUNDATIONS 9

Historical developments –approaches to management– Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Types of BusinessOrganization.

UNIT II PLANNING STRATEGIES 9

Social responsibility–Planning – Objectives – Setting Objectives – Process of Managing through Objectives – Strategies- Policies & Planning Premises- Forecasting – Decision- making.

UNIT III FUNCTIONAL AREA OF ORGANISATION 9

Formal and informal organization – Organization Chart – Structure and Process – Departmentation by difference strategies – Line and Staff authority – Benefits and Limitations – De-Centralization and Delegation of Authority – Staffing – Selection Process - Techniques – HRD – Managerial Effectiveness.

UNIT IV MOTIVATION & DIRECTIONS 9

Objectives– Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job Enrichment – Communication.

UNIT V CONTROLLING STRATEGIES 9

System and process of Controlling – Requirements for effective control – The Budget as Control Technique – Information Technology– Computers in handling the information – Productivity – Problems and Management – Control of Overall Performance – Direct and Preventive Control – Reporting – The Global Environment – Globalization and Liberalization – International Management and Global theory of Management.

Total Hours 45

Course Outcomes

Upon Completion of this course, students will be able to :

CO1: Categorize the development and types of business of organization.
CO2: Demonstration of the various strategies for the planning and decision making.
CO3: Illustrate the various functional area of organization.
CO4: Integration of the innovative and creative objectives for job enrichment.
CO5: Propose to control various issues in the global environment

Text Books

1 Harold Kooritz& Heinz Weihrich "Essentials of Management"- Tata McGraw- Hill-7th Edition-2007.
2 Joseph L Massie "Essentials of Management"- Prentice Hall of India- (Pearson) 4th Edition- 2003.

Reference Books

1 Harold Kooritz& Heinz Weihrich "Essentials of Management"- Tata McGraw- Hill-7th Edition-2007.
2 Joseph L Massie "Essentials of Management"- Prentice Hall of India- (Pearson) 4th Edition- 2003.
3 Tripathy PC And Reddy PN- " Principles of Management"- Tata McGraw-Hill- 1999.
4 Decenzo David- Robbin Stephen A- "Personnel and Human Reasons Management"- Prentice Hall of India- 1996
5 Robbins-" Principles of Management" Pearson education -2005

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Course Outcome	PSO1	PSO2	PSO3	PO1 a	PO2 b	PO3 c	PO4 d	PO5 e	PO6 f	PO7 g	PO8 h	PO9 i	PO 10 j	PO 11 k	PO 12 l
Co1 Categorize the development and types of business of organization.	3	1		3	3		2	3						1	
Co2 Demonstration of the various strategies for the planning and decision making.	3	1		3	2	3	1	1		1				1	
Co3 Illustrate the various functional area of organization.		2		3	2	3	1	1		1				1	
Co4 Integration of the innovative and creative objectives for job enrichment.		2		3	2	3	1	1		1				1	
Co5 Propose to control variousissues in the global Environment		2		3	2	3	2	1		1				1	

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715ECE03	High Speed Networks	L T P C
		3 0 0 3

Course Objectives

- Describe the principles and standards of the ISDN,DSL and ADSL.
- Defend the structure and protocols of the ISDN, ATM, MPLS ,DSL and ADSL.
- Generalize the working of various networking applications.
- Outline the quality of services and traffic in high speed networks.
- Devise the design considerations and future enhancements in HSN

UNIT I HIGH SPEED NETWORKS **9**

Principles and standards - ISDN - B-ISDN- High Speed LAN- Frame Relay- DSL,ADSL.

UNIT II PROTOCOLS AND STRUCTURE **9**

Overview of Higher Layer-Layer ATM and MPLS protocol and Control Plane Protocol- ATM Control Plane Structure and AAL- ATM User Network Interface (UNI) Signaling- ATM control Plane addressing- MPLS Control Plane Architecture- MPLS Label Distribution Protocols- ATM –PNNI- and B-ISDN User Services Part.

UNIT III NETWORKING APPLICATIONS **9**

Packet Voice Networking- Voice Trunking- Broadband Local Loop Emulation- Voice Over ATM and Packet Networks- Multi-protocol Encapsulation over AAL5- ATM Forum LAN Emulation- Ethernet over MPLS

UNIT IV QUALITY OF SERVICE AND TRAFFIC ENGINEERING **9**

Quality of Service-Delivering QoS- Congestion Control and Management- Traffic Parameters and Conformance Definitions- Classes of Service- Achieving Conformance- Checking Conformance- Ensuring conformance

UNIT V DESIGN CONSIDERATIONS AND FUTURE DIRECTIONS **9**

Design Considerations for ATM and MPLS Networks- Efficiency Analysis- Scalability Analysis- Complexity Analysis- Applications of ATM- Applications of MPLS- Possible Future of Multi-Service Networking

Total Hours 45

Course Outcomes

Upon Completion of this course, students will be able to :

- Identify the standards of the ISDN, DSL and ADSL.
- Paraphrase the structure and protocol of the ISDN, ATM, MPLS, DSL and ADSL.
- Prepare the various networking applications.
- Point out the analysis on the congestion control and management.
- Interpret the multiservice networking based on the knowledge of the various analyses.

Text Books

1 Uyless Black: MPLS and Label Switching Networks- Second Edition- PearsonEducation- Asia- 2001.

2 William Stallings"High speed networks"- pearson/PHI,2006

Reference Books

David E- WcDysan and Dave Paw- "Communications Networking: ATM- MPLSTheory and Application

1 Foundations of Multi-Service Networking"- Osborne/McGraw Hill- USA- 2003- Published in India by Dreamtech- New Delhi-

2 SumitKasera- and PankajSethi- "ATM Networks"- Tata McGraw-Hill- New Delhi- 2000-

3 Rainer Handel, ATM Networks, Addison-Wesley-1994

Course Outcome	PSO1	PSO2	PSO3	PO1 a	PO2 B	PO3 c	PO4 d	PO5 e	PO6 f	PO7 g	PO8 h	PO9 i	PO 10 j	PO 11 k	PO 12 l
Co1 Identify the standards ofthe ISDN, DSL and ADSL.		2		3	2	3	1	1		1				1	
Co2 Paraphrase the structureand protocol of the ISDN, ATM, MPLS, DSL and ADSL.		2		3	2	3	1	1		1				1	

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Co3 Prepare the various networking applications.		2		3	2	3	1	1		1				1	
Co4 Point out the analysis onthe congestion control and management.	3	1		3	2		2		1					1	
Co5 Interpret the multiservice networking based on the knowledge of the various analyses.	3	1		3	2		2		1		1			1	

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715ECE09 **TELECOMMUNICATION SWITCHING NETWORKS** **L T P C**
3 0 0 3

COURSE OBJECTIVES

- Recognize the various multiplexing techniques for the transmission systems.
- Analyze the various digital switching techniques.
- Generalize the network synchronization and management.
- Operate the digital loop carrier system.
- Measure the different parameters for traffic control

UNIT I MULTIPLEXING **9**

Transmission Systems- FDM – TDM - Line Coding - SONET/SDH: SONET Multiplexing Overview- SONET Frame Formats- SONET Operations- Administration and Maintenance- Payload Framing and Frequency Justification- Virtual Tributaries- DS3 Payload Mapping- E4 Payload Mapping- SONET Optical Standards- SONET Networks- SONET Rings: Unidirectional Path-Switched Ring- Bidirectional Line- Switched Ring.

UNIT II DIGITAL SWITCHING **9**

Switching Functions- Space Division Switching- Time Division Switching- two dimensional Switching: STS Switching- TST Switching- No-4 ESS Toll Switch- Digital Cross-Connect Systems- Digital Switching in an Analog Environment- Elements of SSN07 signalling.

UNIT III NETWORK SYNCHRONIZATION CONTROL AND MANAGEMENT **9**

Timing: Timing Recovery: Phase-Locked Loop- Clock Instability- Jitter Measurements- Systematic Jitter- Timing Inaccuracies: Slips- Asynchronous Multiplexing- Network Synchronization- Network Control- Network Management.

UNIT IV DIGITAL SUBSCRIBER ACCESS **9**

ISDN: ISDN Basic Rate Access Architecture- ISDN U Interface- ISDN D Channel Protocol- High-Data-Rate Digital Subscriber Loops: Asymmetric Digital Subscriber Line- VDSL- Digital Loop Carrier Systems: Universal Digital Loop Carrier Systems- Integrated Digital Loop Carrier Systems- Next-Generation Digital Loop Carrier- Fiber in the Loop- Hybrid Fiber Coax Systems- Voice band Modems: PCM Modems- Local Microwave Distribution Service- Digital Satellite Services.

UNIT V TRAFFIC ANALYSIS **9**

Traffic Characterization: Arrival Distributions- Holding Time Distributions- Loss Systems- Network Blocking Probabilities: End-to-End Blocking Probabilities- Overflow Traffic- Delay Systems: Exponential service Times- Constant Service Times- Finite Queues.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Implement the different multiplexing technique
CO2: understand the concept of switching
CO3: synchronize, control and managing the Network
CO4: Identify the different methods for subscriber access
CO5: Analyze and route the traffic in the peak hours

TEXT BOOKS

1. Bellamy John- "Digital Telephony"- John Wily & Sons- Inc- 3rd edn- 2000
2. ThiagarajanViswanathan,"Telecommunication switching systems and Networks"-PHI-2004

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REFERENCE BOOKS

1. D N Krishna Kumar- "Telecommunication & Switching"- Sanguine Technical Publishers-Bangalore-2006
2. J.E.Flood, Telecommunication switching, Traffic and Networks, Pearson Education Ltd, New Delhi, 2001.
3. Syed R Ali, Digital switching systems, McGraw-Hill, New York 1998

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Implement the different multiplexing technique	3	2	3	2	2	1	1	1	1	1	2	1	3	2	1
Co2	understand the concept of switching	3	2	3	1	3							1	3	1	
Co3	synchronize, control and managing the Network	2	3	2	1								1	3	1	
Co4	Identify the different methods for subscriber access	2	3	2	1								1	3	1	
Co5	Analyze and route the traffic in the peak hours	3	2	1									1	3	1	

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715ECE10	WIRELESS COMMUNICATION	L T P C
		3 0 0 3

Course Objectives

- List the characteristic of wireless channel
- Classify the various cellular architectures
- Discuss the concepts behind various digital signalling schemes for fading channels
- Illustrate the various multipath mitigation techniques
- Compose the various multiple antenna systems

UNIT I WIRELESS CHANNELS 9

Large scale path loss – Path loss models: Free Space and Two-Ray models -Link Budget design – Small scale fading- Parameters of mobile multipath channels – Time dispersion parameters Coherence bandwidth – Doppler spread & Coherence time, Fading due to Multipath time delay spread – flat fading –frequency selective fading – Fading due to Doppler spread – fast fading – slow fading.

UNIT II CELLULAR ARCHITECTURE 9

Multiple Access techniques - FDMA, TDMA, CDMA – Capacity calculations–Cellular concept Frequency reuse - channel assignment- hand off- interference & system capacity- trunking& grade of service – Coverage and capacity improvement.

UNIT III DIGITAL SIGNALING FOR FADING CHANNELS 9

Structure of a wireless communication link, Principles of Offset-QPSK, p/4-DQPSK, Minimum Shift Keying, Gaussian Minimum Shift Keying, Error performance in fading channels, OFDM principle – Cyclic prefix, Windowing, PAPR.

UNIT IV MULTIPATH MITIGATION TECHNIQUES 9

Equalization – Adaptive equalization, Linear and Non-Linear equalization, Zero forcing and LMS Algorithms. Diversity – Micro and Macro diversity, Diversity combining techniques, Error probability in fadingchannels with diversity reception, Rake receiver

UNIT V MULTIPLE ANTENNA TECHNIQUES 9

MIMO systems – spatial multiplexing -System model -Pre-coding - Beam forming - transmitter diversity, receiver diversity- Channel state information-capacity in fading and non-fading channels.

Total Hours 45

Course Outcomes

Upon Completion of this course, students will be able to :

CO1: Quote the characteristic of wireless channel.
CO2: Categorize the various cellular Systems.
CO3: Recall the Various signalling schemes for fading channels
CO4: Extrapolate the multipath mitigation techniques and analyse their performance.
CO5: Summarize the transmit/receive diversity and MIMO systems and analyse their performance.

Text Books

1 Rappaport,T.S., "Wireless communications", Second Edition, Pearson Education, 2010.
2 Andreas.F. Molisch, "Wireless Communications", John Wiley – India, 2006.

Reference Books

1 .UpenaDalal, " Wireless Communication", Oxford University Press, 2009.
2 David Tse and PramodViswanath, "Fundamentals of Wireless Communication", Cambridge University Press, 2005.
3 Van Nee, R. and Ramji Prasad, "OFDM for wireless multimedia communications", Artech House, 2000.

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Course Outcome	PSO1	PSO2	PSO3	PO1 a	PO2 b	PO3 c	PO4 d	PO5 e	PO6 f	PO7 g	PO8 h	PO9 i	PO 10 j	PO 11 k	PO 12 l
Co1 Quote the characteristic of wireless channel.	3	1		3	2	1								1	
Co2 Categorize the various cellular Systems.	3	2	1	3	2	3	2	2	1	1	1	1	1	1	2
Co3 Recall the Various signaling schemes for fadingchannels	3	1							3	2	3	2	1	2	3
Co4 Extrapolate the multipath mitigation techniques and analyse their performance.	3	1							3	2	3	2	1	2	3
Co5 Summarize the transmit/receive diversity andMIMO systems and analyse their performance.	3	1		3	2	1								1	

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715ECE11	ADVANCED MICROCONTROLLERS	L T P C
		3 0 0 3

COURSE OBJECTIVES

- Recall the RISC AND CISC processor architecture.
- Summarize RL-78 Microcontroller architecture.
- Classify MSP430 16 bit microcontroller.
- Explain peripheral interface using MSP 430 families.
- Compose various communication interface in MSP 430 microcontroller

UNIT I RISC PROCESSOR 9

RISC Vs CISC,RISC properties and evolution, Advanced RISC microcontrollers, PIC18xx microcontroller family, Architecture, Instruction set, ROM,RAM, Timer programming, Serial port programming, Interrupt programming, ADC and DAC interfacing, CCP module and programming.

UNIT II CISC PROCESSORS 9

RL78 16BIT Microcontroller architecture, addressing modes, on Chip memory, ADC, interrupts, MAC unit, Barrel shifter, internal and external clock generation, memory CRC, on chip debug function and self programming.

UNIT III MSP430 16-BIT MICROCONTROLLER 9

The MSP430 Architecture, CPU Registers, Instructions Set, addressing modes, the MSP430 family viz.MSP430x2x, MSP430x4x, MSP430x5x. Low power aspects of MSP430: Low power modes, active Vs standby current consumption, FRAM Vs Flash for low power and reliability.

UNIT IV PROGRAMMING AND PERIPHERALS INTERFACE USING MSP430 FAMILIES 9

Memory mapped peripherals, I/O pin multiplexer, Timers, RTC, Watch dog timer, PWM control, analog interfacing and data acquisition ,DMA, programming with above internal peripheral using optimal power consumption. Case study: Remote control of air conditioner and home appliances.

UNIT V COMMUNICATION INTERFACE USING MSP430 MICROCONTROLLER 9

Serial and parallel communication, Synchronous and asynchronous interfaces, Implementing and programming of: UART, I2C and SPI protocols. Wireless connectivity: NFC, Zigbee, Bluetooth and WIFI. MSP430 development tools. Case study: Implementing WIFI connectivity in smart electric meter.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Distinguish between RISC AND CISC processor architecture.
CO2: Outline the RL-78 Microcontroller architecture.
CO3: Illustrate the MSP 430 Microcontroller architecture.
CO4: Recognize various peripheral interface in MSP 430.
CO5: Categorize the different communication interface in real time environment.

TEXT BOOKS

1. Alexander G ,James M conard,"creating fast, responsive and energy efficient embedded systems using the reneseas,RL 78 microcontroller ",micrium press, USA,reprinted by S.P printers,Harayana,ISBN no:978-1-935772-98-9,2011

REFERENCE BOOKS

- MuhammmedaliMazidi,Rolind D Mckinlay and Danny causey,"PIC microcontroller and embedded systems" Pearson education,2008
- John H Davies,"MSP 430 Microcontroller basics,Elseiver,2008

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Distinguish between RISC AND CISC processor architecture.	3	2	1									1	3	1	
Co2	Outline the RL-78 Microcontroller architecture.	3	2	1									1	3	1	
Co3	Illustrate the MSP 430 Microcontroller architecture.	3	2	1									1	3	1	
Co4	Recognize various peripheral interface in MSP 430.	3	2	1									1	3	1	
Co5	Categorize the different communication interface in real time environment.	3	2	1									1	3	1	

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815ECT01 **DISASTER MITIGATION AND MANAGEMENT** **L T P C**
3 0 0 3

Course Objectives

- Acquire awareness about the disaster.
- Develop the technology for disaster risk reduction.
- Understand the application in disaster risk reduction.
- Study the measure of the various natural calamities
- Study the measurement of Seismicity

UNIT I **Introduction** **9**

Introduction – Disaster preparedness – Goals and objectives of ISDR Programme- Risk identification – Risk sharing – Disaster and development: Development plans and disaster management –Alternative to dominant approach – disaster-development linkages -Principle of risk partnership.

UNIT II **Application of Technology in disaster risk reduction** **9**

Application of various technologies: Data bases – RDBMS – Management Information systems – Decision support system and other systems – Geographic information systems – Intranets and extranets – video teleconferencing. Trigger mechanism – Remote sensing-an insight – contribution of remote sensing and GIS - Case study.

UNIT III **Awareness of Risk reduction** **9**

Trigger mechanism – constitution of trigger mechanism – risk reduction by education – disaster information network – risk reduction by public awareness.

UNIT IV **Development planning on disaster** **9**

Implication of development planning – financial arrangements – areas of improvement – disaster preparedness – community based disaster management – emergency response.

UNIT V **Seismicity** **9**

Seismic waves – Earthquakes and faults – measures of an earthquake, magnitude and intensity – ground damage – Tsunamis and earthquakes

Total Hours **45**

Course Outcomes

Upon Completion of this course, students will be able to :

CO1: Create Awareness about disaster
CO2: Develop the technology for disaster risk reduction
CO3: Manage disaster risk reduction at the time of disaster
CO4: Measure the various natural calamities
CO5: Analyse the measurement of earthquake occurences

Text Books

1 PardeepSahni, Madhavimalalgoda and ariyabandu, "Disaster risk reduction in south asia", PHI
2 Amitasinvhal, "Understanding earthquake disasters" TMH, 2010.

Reference Books

1 PardeepSahni, AlkaDhameja and Uma medury, "Disaster mitigation: Experiences and reflections", PHI

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
Co1	Create Awareness about disaster	3	2	3	1	3							1	3	1	
Co2	Summarize the technology for disaster risk reduction	3	2	3	1	3							1	3	1	
Co3	Outline the inter relationships between disasters and development.	3	2	1									1	3	1	
Co4	Illustrate the disaster risk management in india	3	2	3	1	3							1	3	1	

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Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
Co5	Analyse the case studies and field works in disaster management.	3	2	1									1	3	1	

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815ECE01	CELLULAR AND MOBILE COMMUNICATION	L T P C
		3 0 0 3

Course Objectives

- Understand the cellular concept, frequency reuse, multiple access and hand-off strategies.
- Analyze and design wireless and mobile cellular communication systems over a stochasticfading channel.
- Analyze the different speech coding techniques for vocoders
- Understand the digital cellular systems(GSM, CDMA)
- Know the present day cellular technologies implemented in LTE like OFDM, MIMO systems

UNIT I MULTIPLE ACCESS TECHNIQUES AND CELLULAR CONCEPT 9

Multiple Access Techniques: FDMA- TDMA- CDMA- SDMA- CSMA protocols- Cellular Concept: Frequency reuse- channel assignment- hand off- Interference and system capacity- tracking and grade of service- ImprovingCoverage and capacity in Cellular systems

UNIT II MOBILE RADIO PROPAGATION 9

Free space propagation model- relating power to electric field -Propagation mechanisms- reflection –Ground reflection model -diffraction- scattering- link budget design using path loss models -Small scale Multipath propagation- Impulse response model of a multi-path channel- Small scale Multipath measurements parameters of Mobile multipath channels- types of small scale fading

UNIT III MODULATION TECHNIQUES- DIVERSITY AND ANTENNAS 9

Modulation Techniques: Binary frequency shift keying- Minimum Shift Keying- Gaussian MSK- Orthogonal Frequency Division Multiplexing- Diversity reception- -Types of diversity- RAKE receiver -Basic combining methods- Base station and mobile station antennas

UNIT IV SPEECH CODING 9

Characteristics of speech signals - Quantization techniques - Adaptive Differential pulse code modulation(ADPCM)- Frequency domain coding of speech Vocoders- Linear Predictive Coders- Selection ofSpeech Codecs for Mobile Communication- GSM Codec- USDC Codec - Performance evaluation

UNIT V CELLULAR STANDARDS 9

AMPS- GSM-Architecture- Channels and Frame structure- GPRS- EDGE- CDMA standards (IS-95)-Forward CDMA channel and reverse CDMA channel –W-CDMA Layer architecture

Total Hours 45

Course Outcomes

Upon Completion of this course, students will be able to :

CO1: Acquire knowledge in multiple access techniques and cellular concepts
CO2: Demonstrate the mobile propagating mechanism
CO3: Acquire knowledge in modulation techniques and mobile antennas
CO4: Recall the different speech coding techniques in vocoders
CO5: Identify the various Cellular Standards by their architecture

Text Books

1. T.S.Rappaport- Wireless Communications: Principles and Practice- Second Edition- Pearson Education/ Prentice Hall of India- Third Indian Reprint 2003.
2. Vijay K-Garg- "Wireless Network Evolution 2G to 3G"- Pearson Education- New Delhi- 2003.

Reference Books

1. Dharma Prakash Agarwal and Qing – An Zeng- "Introduction to Wireless and Mobile Systems"- 2nd Edition- Thomson Learning- New Delhi- 2007
2. William C.Y.Lee-"Mobile and Cellular Telecommunications Analog and Digital Systems"- 2 e –TMH, Tse & viswanath "cellular communications Schiller"mobile communications" pearson 2005

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Course Outcome	PSO1	PSO2	PSO3	PO1 a	PO2 b	PO3 c	PO4 d	PO5 e	PO6 f	PO7 g	PO8 h	PO9 i	PO 10 j	PO 11 k	PO 12 l
Co1 Acquire knowledge in multiple access techniques andcellular concepts	3	1		3	2	3	1	3						1	
Co2Demonstrate the mobile propagating mechanism	3	1		3	2	3	1	3						1	
Co3 Acquire knowledge in modulation techniques and mobile antennas	3	1		3	2	3	1	3						1	
Co4 Recall the different speech coding techniques invocoders	3	1		3	2	3	1	3						1	
Co5 Identify the various Cellular Standards by theirarchitecture	3	1		3	2	3	1	3						1	

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815ECE02 **ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY** **L T P C**
3 0 0 3

COURSE OBJECTIVES

- Study about the basic concepts of the EMI/EMC.
- Understand EMI Coupling principles.
- Study the various EMI control techniques.
- Know the circuit design for EMC and PCB.
- Learn the measurement methods and standards of EMI

UNIT I **EMI/EMC OVERVIEW** **9**

Aspects of EMC - Electrical dimensions - Common EMC units - EMC requirements for electronicsystems - Electromagnetic interference - EMI noise sources - Methods of noise coupling - Methods of eliminating interference- Susceptibility - Differential and common-mode noise source

UNIT II **EMI PROPERTIES OF PASSIVE COMPONENTS** **9**

Wires - Component leads- Resistors - Capacitors – Inductors - Ferrite beads - Common-mode chokes- Mechanical switches - PCB lands - Electromechanical devices

Crosstalk and Cabling: Crosstalk via common impedance - Capacitive crosstalk- Inductive - crosstalk - Crosstalk combinations - Reduction of crosstalk - Shield transfer impedance - Shielding of electricfield - Shielding of magnetic field - Different types of cables - Effect of Pigtails - Cable layouts.

UNIT III **EMI CONTROL TECHNIQUES** **9**

Grounding: Safety grounds - Signal grounds- Single-point ground systems- Multipoint ground systems- Hybrid grounds - Functional ground layout - Practical low-frequency grounding - Hardwaregrounds - Grounding of amplifier shields - Grounding of cable shields -Ground loops - Elimination ofground loops - Shield grounding at high frequencies - Guard shields

Shielding: Characteristic and wave impedances - Shielding effectiveness - Attenuation of fields bymetal plates - Shielding with magnetic materials - Apertures - Faraday cage - Conductive gaskets- conductive window and coatings

Filtering: Mechanism of conducted emission - Concept of power line filter design - Diagnostic techniques - Layout of filter - Non-linear Phenomena - Consequences of nonlinear characteristics - Nonlinearity of semiconductor devices - Increasing the immunity of semiconductor circuits: aspects of system layout and adaptation of circuit design- Examples from practice

UNIT IV **DIGITAL CIRCUIT NOISE AND RADIATION** **9**

Spectra of digital circuit waveforms - Analog versus digital circuits - Digital logic noise - Digital circuit ground noise - Noise minimization - Differential-mode radiation- Controlling differential mode radiation - Common-mode radiation and control **Electrostatic Discharge:** Static generation- Human body model- Static discharge- ESD protection in equipment design- EMI Emission Measurements and Test Methods.

UNIT V **EMI MEASUREMENTS AND STANDARDS** **9**

Open-field test site - Shielded enclosures - Radio-frequency anechoic chamber – Antennas - Line impedance stabilisation network - Absorbing clamp – Requirements and types of interference wave measuring instruments - Test procedures for conducted EMI emission - Test procedures for radiated EMI emissions - Susceptibility standards and regulations- Susceptibility of electronics to EMI/ESD - Software and hardware protection - Continuous waves and transients - Susceptibility tests- procedures and equipment -Problems with susceptibility tests

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Ability to understand the concepts in EMI/EMC.
CO2: Ability to understand the EMI coupling principles
CO3: Implementation of EMI control techniques such as grounding, shielding, filtering.
CO4: Implementation of EMC in equipment design of PCB.
CO5: Analyzing the various parameters with the knowledge of the measurements and standards

TEXT BOOKS

1. V. Prasad Kodali, Engineering Electromagnetic Compatibility, IEEE Press, 1996.
2. Clayton R. Paul– "Introduction to electromagnetic compatibility"- John Wiley & Sons- 2006

REFERENCE BOOKS

1. Weston David A., Electromagnetic compatibility : principles and applications, 2/E, CRC Press,2001
2. Tim Williams, EMC for Product Designers, 4th Edition, Elsevier/Newnes, Oxford, 2007

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
Co1	Ability to understand the concepts in EMI/EMC.	3	2	3	1	3							1	3	1	
Co2	Ability to understand the EMI coupling principles									1	3	1	2	1		3
Co3	Implementation of EMI control techniques such as grounding, shielding, filtering.	3	3		2								1	3	1	
Co4	Implementation of EMC in equipment design of PCB.	2	3		1	2							1	3	1	
Co5	Analyzing the various parameters with the knowledge of the measurements and standards.	2	3		1	2							1	3	1	

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815ECE03	ARM SYSTEM ARCHITECTURE AND APPLICATIONS	L T P C
		3 0 0 3

COURSE OBJECTIVES

- Understand the ARM architecture
- Understand the architecture for high level language
- Develop the architecture for system development
- Discuss the memory of ARM
- Implement ARM in Embedded applications

UNIT I ARM ARCHITECTURE **9**

ARM Embedded system-ARM processor fundamentals-ARM instruction set- The Thumb instruction set-ARM processor cores- ARM assembly language programming

UNIT II ARCHITECTURAL SUPPORT FOR HIGH LEVEL LANGUAGE **9**

Writing and optimizing ARM assembly code-Instruction schedules- Register allocation –Conditional execution- looping constructs- Bit manipulation-Function and procedures- use of memory.

UNIT III ARCHITECTURAL SUPPORT FOR SYSTEM DEVELOPMENT **9**

The ARM memory interface-The advanced Microcontroller bus architecture(AMBA)-Hardware system prototyping tools-the ARMulator- The JTAG boundary scan test architecture-The ARM Embedded trace- debug architecture-Signal processing support-DSP on the ARM-Architectural support for OS

UNIT IV MEMORY HIERARCHY AND ARM CPU CORES **9**

Caches-Memory protection unit-Memory management unit-ARM CPU cores-The AMULET asynchronous ARM Processors

UNIT V EMBEDDED ARM APPLICATIONS **9**

Embedded Operating systems-Principle components-Simple operating system. The VLSI Ruby II Advanced communication processor-The VLSI ISDN subscriber processor-The one CTMVWS22100 GSM chip-The Ericsson –VLSI Bluetooth Baseband Controller-The ARM 7500 and ARM 7500FE.The ARM 7100-The SA-1100

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Describe the ARM architecture
CO2: Explain the architecture for high level language
CO3: Build the architecture for system development
CO4: Explain the memory of ARM
CO5: Implement ARM in Embedded applications

TEXT BOOKS

1. Steve Furber,"ARM System-on-chip architecture" Addison Wesley,2000
2. Andrew N.SLOSS,DominicSYMES,ChrisWright,"ARM System Developer's Guide, Designing and optimizing system software",Morgan Kaufmann,2007.

REFERENCE BOOKS

1. Daniel W. Lewis, "Fundamentals of Embedded Software with the ARM Cortex-M3", Prentice Hall, 1st Edition, 2012
2. Joseph Yiu, "The Definitive Guide to the ARM Cortex-M3", Elsevier, 2nd Edition, 2010
3. David Seal , "ARM Architecture Reference Manual", Pearson Education ,2007

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Ability to understand the concepts in EMI/EMC.	3	2	3	1	3							1	3	1	
Co2	Ability to understand the EMI coupling principles									1	3	1	2	1		3
Co3	Implementation of EMI control techniques such as grounding, shielding, filtering.	3	3		2								1	3	1	
Co4	Implementation of EMC in equipment design of PCB.	2	3		1	2							1	3	1	
Co5	Analyzing the various parameters with the knowledge of the measurements and standards.	2	3		1	2							1	3	1	

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815ECE04 **RADAR AND NAVIGATIONAL AIDS** **L T P C**
3 0 0 3

COURSE OBJECTIVES

- Understand the fundamentals of RADAR
- Generalize the types of RADAR
- Recognize the transceiver of RADAR
- Describe the different methods of direction finding
- Outline the various methods navigation in RADAR

UNIT I INTRODUCTION TO RADAR **9**

Basic Radar –The simple form of the Radar Equation- Radar Block Diagram- Radar Frequencies – Applications of Radar – The Origins of Radar-The Radar Equation-Detection of Signals in Noise-Receiver Noise and the Signal-to-Noise Ratio- Probability Density Functions- Probabilities of Detection and False Alarm- Integration of Radar Pulses- Radar Cross Section of Targets- Radar cross Section Fluctuations- Transmitter Power-Pulse Repetition Frequency- Antenna Parameters-System losses – Other Radar Equation Considerations

UNIT II MTI AND PULSE DOPPLER RADAR **9**

Doppler and MTI Radar- Delay –Line Cancellers- Staggered Pulse Repetition Frequencies –Doppler Filter Banks - Digital MTI Processing - Moving Target Detector - Limitations to MTI Performance - MTI from a Moving Platform (AMIT) - Pulse Doppler Radar – Other Doppler Radar Topics- Tracking with Radar –Monopulse Tracking – Conical Scan and Sequential Lobing - Limitations to Tracking Accuracy - Low-Angle Tracking - Tracking in Range - Other Tracking Radar Topics -Comparison of Trackers - Automatic Tracking with Surveillance Radars (ADT).

UNIT III RADAR TRANSMITTER AND RECEIVER **9**

Radar Transmitters:

Linear Beam Power Tubes - Solid State RF Power Sources - Magnetron - Crossed Field Amplifiers - Other RF Power Sources - Other aspects of Radar Transmitter-

Radar Receivers :

The Radar Receiver - Receiver noise Figure - Super heterodyne Receiver - Duplexers and Receiver Protectors- Radar Displays.

Detection of Signals in Noise :

Matched –Filter Receiver –Detection Criteria – Detectors –-Automatic Detector - Integrators - Constant-False-Alarm Rate Receivers - The Radar operator – Signal Management - Propagation Radar Waves - Atmospheric Refraction –Standard propagation - Nonstandard Propagation - The Radar Antenna - Reflector Antennas - Electronically Steered Phased Array Antennas - Phase Shifters - Frequency-Scan Arrays.

UNIT IV RADIO DIRECTION & RANGES **9**

The Loop Antenna - Loop Input Circuits - An Aural Null Direction Finder – The Goniometer - Errors in Direction Finding - Adcock Direction Finders - Direction Finding at Very High Frequencies - Automatic Direction Finders - The Commutated Aerial Direction Finder - Range and Accuracy of Direction Finders.

Radio Ranges :

The LF/MF Four course Radio Range - VHF Omni Directional Range(VOR) - VOR Receiving Equipment - Range and Accuracy of VOR - Recent Developments.

Hyperbolic Systems of Navigation (Loran and Decca):

Loran-A - Loran-A Equipment - Range and precision of Standard Loran - Loran- C - The Decca Navigation System - Decca Receivers - Range and Accuracy of Decca - The Omega System.

UNIT V METHODS OF NAVIGATION **9**

DME and TACAN : Distance Measuring Equipment - Operation of DME - TACAN - TACAN Equipment.

Aids to Approach and Landing :

Instrument Landing System - Ground Controlled Approach System – Microwave Landing System(MLS).

Doppler Navigation :

The Doppler Effect - Beam Configurations -Doppler Frequency Equations - Track Stabilization - Doppler Spectrum - Components of the Doppler Navigation System - Doppler range Equation - Accuracy of Doppler Navigation Systems.

Inertial Navigation :

Principles of Operation - Navigation Over the Earth - Components of an Inertial Navigation System - Earth Coordinate Mechanization - Strapped-Down Systems - Accuracy of Inertial Navigation Systems.

Satellite Navigation System :

The Transit System - Navstar Global Positioning System (GPS).

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Discuss the fundamentals of RADAR
CO2: Describe the types of RADAR
CO3: Explain the transceiver of RADAR
CO4: Demonstrate the different methods of direction finding
CO5: Demonstrate the various methods navigation in RADAR

TEXT BOOKS

1. Merrill I- Skolnik -" Introduction to Radar Systems"- Tata McGraw-Hill (3rd Edition) 2003

REFERENCE BOOKS

1. G.S.N. Raju -"Radar Engineering and Fundamentals of Navigational Aids"-wiley 2020
2. N.S.Nagaraja, "Elements of Electronic Navigation Systems", 2nd Edition, TMH, 2000.
3. Peyton Z- Peebles:- "Radar Principles"- Johnwiley- 2004
4. J-C Toomay- " Principles of Radar"- 2nd Edition –PHI- 2004
5. NadavLevanon-" Radar Signals"-1/E- IEEE Computer Society Press-2004

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
Co1	Discuss the fundamentals of RADAR	3	2		1	2							1	3	1	
Co2	Describe the types of RADAR	2	2		1	3							1	2	1	
Co3	Explain the transceiver of RADAR									1	3	1	2		1	2
Co4	Demonstrate the different methods of direction finding	3	3		2	3							1	3	1	
Co5	Demonstrate the various methods navigation in RADAR	1			1		3	3	2						1	3

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815ECE08	ASIC Design	L T P C
		3 0 0 3

COURSE OBJECTIVES

- Describe the concepts of ASIC design methodology, data path elements, operators, I/O cells.
- Analyze the design of programmable ASICs logic cells and ASIC I/O cells.
- Apply logical effort technique for predicting delay, delay minimization and ASIC architectures.
- Design and apply the algorithms for logic synthesis.
- Explain algorithms for floor planning and placement of cells for optimized area and speed.

UNIT I INTRODUCTION TO ASIC, CMOS LOGIC AND ASIC LIBRARY 9

Types of ASICs - Design flow - CMOS transistors - Combinational Logic Cell – Sequential logic cell - Data path logic cell - Transistors as Resistors - Transistor Parasitic Capacitance- Logical effort.

UNIT II PROGRAMMABLE ASICS, PROGRAMMABLE ASIC LOGIC CELLS AND PROGRAMMABLE ASIC I/O CELLS 9

Anti fuse - static RAM - EPROM and EEPROM technology - Actel ACT - Xilinx LCA –Altera FLEX - Altera MAX DC & AC inputs and outputs - Clock & Power inputs - Xilinx I/O blocks

UNIT III PROGRAMMABLE ASIC ARCHITECTURE 9

Actel ACT -Xilinx LCA - Xilinx EPLD - Altera MAX 5000 and 7000 - Design systems - Logic Synthesis - Half gate ASIC -Schematic entry - Low level design language – Introduction to PLA tools.

UNIT IV LOGIC SYNTHESIS, SIMULATION AND TESTING 9

VHDL and logic synthesis - types of simulation -boundary scan test – fault simulation automatic test pattern generation.

UNIT V ASIC CONSTRUCTION, FLOOR PLANNING, PLACEMENT AND ROUTING 9

System partition - FPGA partitioning – partitioning methods - floor planning - placement - physical design flow - global routing - detailed routing - special routing - circuit extraction -DRC.

TOTAL HOURS: 45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Acquire knowledge in various physical design in ASIC.
CO2: Understand the concept of ASIC Logic Cells and ASIC I/O Cells.
CO3: Design Programmable ASIC Architecture.
CO4: Use the simulation techniques at various levels in ASIC design flow.
CO5: Design ASIC and FPGA based floor planning and placement of cells for optimized area and speed.

TEXT BOOKS

1. Smith M.J.S, - " Application - Specific Integrated Circuits " - Addison -Wesley Longman Inc., 2010
2. Andrew Brown, - " VLSI Circuits and Systems in Silicon", McGraw Hill, 1991

REFERENCE BOOKS

1. Francis R.J., Rose J., Vranesic Z.G., Brown S.D., "Field Programmable Gate Arrays " - Springer Verleg, 2007.
2. Mohammed Ismail and Terri Fiez, " Analog VLSI Signal and Information Processing ", Mc Graw Hill, 1994
3. David A.Hodges, Analysis and Design of Digital Integrated Circuits (3/e), MGH 2004

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
Co1	Acquire knowledge in various physical design in ASIC.	3	2		2	3				1			1		2	
Co2	Understand the concept of ASIC Logic Cells and ASIC I/O Cells.	3	2	3	1	1		1					1		2	
Co3	Design Programmable ASIC Architecture.	3	2	3	1	1		1					1		2	
Co4	Use the simulation techniques at various levels in ASIC design flow.	3	3		2	3							1	3	1	
Co5	Design ASIC and FPGA based floor planning and placement of cells for optimized area and speed.	3	2	3	2	1		1					1	3	1	

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815ECE09	SATELLITE COMMUNICATION	L T P C
		3 0 0 3

COURSE OBJECTIVES

- Understand the Kepler's law of motion and different orbital elements
- Know the Attitude and orbit control in spacecraft subsystems and link design
- Understand the analog and digital multiple access
- Understand the distinct types of Earth segment
- Summarize the various applications of Satellite.

UNIT I ORBIT DYNAMICS **9**

Kepler's Laws of planetary motion , orbital parameters, orbital perturbations, station keeping, geo stationary and non Geo-stationary orbits – Look Angle Determination- Limits of visibility –eclipse-Sub satellite point –Sun transit outage-Launching Procedures - launch vehicles and propulsion.

UNIT II SPACE SEGMENT AND LINK DESIGN **9**

Space Segment: Power Supply – Attitude Control – Spinning Satellite Stabilization – Momentum Wheel Stabilization – Station Keeping – Thermal Control – TT&C Subsystem – Transponders – Wideband Receiver – Input Demultiplexer – Power Amplifier – Antenna Subsystem

Link Design: Satellite uplink – down link- link power budget equation - C/No - G/T- Noise temperature- System noise- propagation factors- rain and ice effects- Earth Station parameters- polarization.

UNIT III SATELLITE ACCESS AND CODING METHODS **9**

Modulation and Multiplexing: Voice, Data and Video- Analog Satellite communication – FDMA Technique, SCPC,CSSB system – Digital satellite communication system –TDMA ,CDMA Techniques.

UNIT IV EARTH SEGMENT **9**

Introduction - Active and passive satellite- Transmitters- receivers- Antennas- Terrestrial Interface- TVRO- MATV- CATV- Test Equipments- Measurements on G/T- C/No- EIRP- Antenna Gain.

UNIT V SATELLITE APPLICATIONS **9**

INTELSAT Series, INSAT, VSAT, INMARSAT, Satellite Navigational System-IRNSS , Direct Broadcast satellites (DBS)- Direct to home Broadcast (DTH), Digital audio broadcast (DAB)- Business TV(BTV), GRAMSAT, Specialized services – E –mail, Video conferencing, Internet.

TOTAL HOURS: 45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Analyze different orbital elements.
CO2: Control the space craft subsystems and design link budget analysis.
CO3: Apply multiple access technique for Satellite Communication.
CO4: Describe the various types of Earth Segments.
CO5: Understand different applications of Satellite

TEXT BOOKS

1. Dennis Roddy- 'Satellite Communication, 4th Edition'- Tata McGraw Hill-2017
2. Wilbur L- Pritchard- Hendri G- Suyderhoud- Robert A- Nelson- 'Satellite Communication Systems Engineering , 2nd Edition'- Pearson/Prentice Hall- II Edition- 1993

3. Timothy Pratt - Charles Bostian & Jeremy Allmuti- Satellite Communications-John Willy & Sons (Asia) Pvt- Ltd- 2004

REFERENCE BOOKS

1. Tri T. Ha, "Digital Satellite Communication", II nd edition, 2017.
2. M-Richharia : Satellite Communication Systems (Design Principles)Pearson Second Edition

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Analyze different orbital elements.	3	2	3	1	1		1					1	3	1	
Co2	Control the space craft subsystems and design link budget analysis.	3	2	3	1	1		1					1	3	1	
Co3	Apply multiple access technique for Satellite Communication.	3	2	3	1	1		1					1	3	1	
Co4	Describe the various types of Earth Segments.	3	2	3	2	1		1					1		2	
Co5	Understand different applications of Satellite.	3	2	3	1	1		1					1		2	

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815ECE10 **MICROWAVE INTEGRATED CIRCUITS DESIGN** **L T P C**
3 0 0 3

COURSE OBJECTIVES

- Design and realize the couplers and microstrip lines
- Design and realize the filters using microstrip lines
- Design and analyze the amplifiers using MICs
- Analyze the oscillation and stability conditions of different Microwave oscillators
- Design Microwave mixers for various applications

UNIT I POWER DIVIDERS **9**

Design and realization of Power Dividers: Hybrids- directional couplers etc using Strip lines and Microstrip lines.

UNIT II FILTER DESIGN **9**

Filter Design: Kuroda identities - K inverter – J inverter- Filter Transformations- Realization using Strip line and Microstrip line.

UNIT III ANALYSIS OF TRANSISTOR AMPLIFIER **9**

Transistor Amplifier: Power gain equations- stability considerations- Analysis and Design using MICs.

UNIT IV OSCILLATOR DESIGN **9**

Transistor Oscillators: Active Devices for Microwave Oscillators- Three port S parameter characterization of transistors- Oscillation and stability conditions

UNIT V DIODE MIXER **9**

Diode Mixers: Mixer Design- Single ended mixer- Balanced mixer- Image Rejection mixer- Phase shifter Design- PIN diode- Phase shifter.

TOTAL HOURS: 45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Realize the couplers and microstrip lines
CO2: Realize the filters using microstrip lines
CO3; Analyze the various amplifiers parameters like power gain, stability issues for MICs
CO4: Examine the oscillation and stability conditions of different Microwave oscillators
CO5: Identify various Microwave mixers for desired applications

TEXT BOOKS

1. I-J-Bahl& P-Bhartia: Microwave Solid State Circuit Design , 2nd Edition- Wiley Interscience
2. G-D Vendelin- Design of Amplifier and Oscillator by the S parameter method-John Wiley-1982
3. Microwave Integrated Circuit, K.C Gupta

REFERENCE BOOKS

1. T-C- Edwards- Foundations for Microstrip Circuit Design, 4th Edition- John Wiley- 2016
2. Stripline - like Transmission lines for Microwave Integrated Circuit, B. Bhat, S.K.Koul, Wiley Eastern Ltd, New Delhi

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Co1	Realize the couplers and microstrip lines	3	2	3	1	1		1					1		2	
Co2	Realize the filters using	3	2		2		1						1	3	1	

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Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	microstrip lines															
Co3	Analyze the various amplifiers parameters like power gain, stability issues for MICs	3	2		2		1		1				1	3	1	
Co4	Examine the oscillation and stability conditions of different Microwave oscillators	3	2		2		1		1				1	3	1	
Co5	Identify various Microwave mixers for desired applications	3	2		2		1						1	3	1	

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815ECE11	LOW POWER VLSI DESIGN	L T P C
		3 0 0 3

COURSE OBJECTIVES

- Know the sources of power consumption in CMOS circuits.
- Learn the techniques on logic level and circuit level power optimization.
- Understand the various power reduction techniques and the power estimation methods.
- Understand various low power analysis techniques for combinational and sequential circuits.
- Study the design concepts of low power circuits

UNIT I POWER DISSIPATION IN CMOS CIRCUITS 9

Hierarchy of limits of power – Sources of power consumption – Physics of power dissipation in CMOS FET devices – Basic principle of low power design .

UNIT II POWER OPTIMIZATION 9

Logic level power optimization – Circuit level low power design – circuit techniques for reducing Power consumption in adders and multipliers.

UNIT III DESIGN OF LOW POWER CIRCUITS 9

Computer arithmetic techniques for low power system – reducing power consumption in memories – low power clock, Inter connect and layout design – Advanced techniques –Special techniques

UNIT IV POWER ESTIMATION 9

Power Estimation technique – logic power estimation – Simulation power analysis –Monte-Carlo power Estimation, Advanced sampling Techniques, Vector Compaction – Probabilistic power analysis–combinational circuits, Real-Delay gate power Estimation, Sequential Circuits

UNIT V SYNTHESIS AND SOFTWARE DESIGN 9

Synthesis for low power – Behavioural level transforms, logic level optimization, Circuit level – software design for low power- sources of software power dissipation,software power optimizations, Automated low power code generation.

TOTAL HOURS: 45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Analyze the power dissipation in various CMOS circuits
CO2: Outline the mechanisms of power dissipation in CMOS integrated circuits;
CO3: Design the various low power circuits
CO4: Estimate power analysis of low power combinational circuits and sequential circuits
CO5: Summarize the synthesis and software design of circuit-level and system-level power optimization techniques.

TEXT BOOKS

1. Kaushik Roy and S.C.Prasad, "Low power CMOS VLSI circuit design", Wiley, 2000
2. Dimitrios Soudris, Christians Pignet, Costas Goutis, "Designing CMOS Circuits for Low Power",Kluwer, 2002.

REFERENCE BOOKS

1. Steven M.Rubin, "Computer Aids for VLSI Design", Addison Wesley Publishing, 2006
2. J.B.Kulo and J.H Lou, "Low voltage CMOS VLSI Circuits", Wiley 1999
3. A.P.Chandrasekaran and R.W.Broadersen, "Low power digital CMOS design", Kluwer,1995
4. Gary Yeap, "Practical low power digital VLSI design", Kluwer, 1998
5. AbdelatifBelaouar, Mohamed.I.Elmasry, "Low power digital VLSI design", Kluwer, 1995

6. James B.Kulo, Shih-Chia Lin, "Low voltage SOI CMOS VLSI devices and Circuits", John
7. Wiley and sons, inc. 2001

Course Outcome		PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
Co1	Analyze the power dissipation in various CMOS circuits	3	2		2		1		1				1	3	1	
Co2	Outline the mechanisms of power dissipation in CMOS integrated circuits;	3	2		2		1						1	3	1	
Co3	Design the various low power circuits	3	2	3	1	3							1	3	1	
Co4	Estimate power analysis of low power combinational circuits and sequential circuits	3	2	3	1	3							1	3	1	
Co5	Summarize the synthesis and software design of circuit-level and system-level power optimization techniques.	3	2	3	1	3							1	3	1	

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