MVR
College of Engineering & Technology

(An Autonomous Institution)

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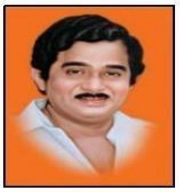


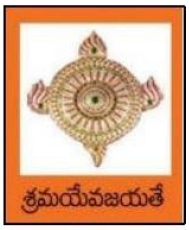
Department of Electronics & Communication Engineering

COURSE STRUCTURE AND SYLLABUS

For UG –RM21

B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

(Applicable for batches admitted from 2021-2022)



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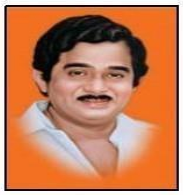

Department of Electronics & Communication Engineering

COURSE STRUCTURE

II Year – I SEMESTER						
S. No	**Code**	**Courses**	**L**	**T**	**P**	**Credits**
1	**21BS2101**	Transform Techniques	3	0	0	3
2	**21EC2101**	Electronics devices and circuits	3	0	0	3
3	**21EC2102**	Signals and systems	3	0	0	3
4	**21EC2103**	Control systems	3	0	0	3
5	**21EC2104**	Switching theory and logic design	3	0	0	3
6	**21EC2151**	Electronics devices and circuits-lab	0	0	3	1.5
7	**21EC2152**	Switching theory logic design-lab	0	0	3	1.5
8	**21EC2153**	Basics simulation -lab	0	0	3	1.5
9	**21EC2154**	PCB Design (skilled developed program)	0	0	2	2
10	**21MC2101**	Essence of Indian Traditional Knowledge				
Total Credits			**21.5**			

II Year – II SEMESTER						
S. No	**Code**	**Courses**	**L**	**T**	**P**	**Credits**
1	**21BS2203**	Complex variables	3	0	0	3
2	**21EC2201**	Electronic Circuit Analysis And Design	3	0	0	3
3	**21EC2202**	Analog Communication	3	0	0	3
4	**21EC2203**	Linear IC Applications	3	0	0	3
5	**21MB2201**	Managerial Economics and Financial Accountancy	3	0	0	3
6	**21EC2251**	Electronic Circuit Analysis And Design-lab	0	0	3	1.5
7	**21EC2252**	Analog Communication-lab	0	0	3	1.5
8	**21EC2253**	Linear IC Applications-lab	0	0	3	1.5
9	**21EC2254**	Arduino (skilled developed program)	0	0	2	2
Total Credits			**21.5**			

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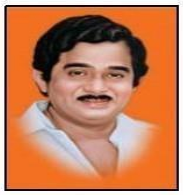

Department of Electronics & Communication Engineering

III B. Tech – I Semester						
S.No	**Code**	**Courses**	**Hours per week**			**Credits**
			L	**T**	**P**	**C**
1		Digital System Design	**3**	**0**	**0**	**3**
2		Electromagnetic Waves And Transmission Lines	**3**	**0**	**0**	**3**
3		Digital Communications	**3**	**0**	**0**	**3**
4	OE-I	**Open Elective-I** 1. Renewable Energy Source 2. Concepts of optimization techniques 3.Data base management system	**3**	**0**	**0**	**3**
5	PE-I	**Professional Elective-I** 1. Antenna And Wave Propagation 2. Electronic Measurements and Instrumentation 3. Computer Architecture & Organization	**3**	**0**	**0**	**3**
6		Digital System Design Lab	**0**	**0**	**3**	**1.5**
7		Digital Communications Lab	**0**	**0**	**3**	**1.5**
8	so	**Skill Oriented Course – III** **1.**Soft Skills Course (communication skills & training skills)	**0**	**0**	**4**	**2**
9		Employability Skills-I	**2**	**0**	**0**	**0**
10		**Summer Internship 2 Months (Mandatory) After Second Year (To Be Evaluated During V Semester**	**0**	**0**	**0**	**1.5**
Total credits						**21.5**

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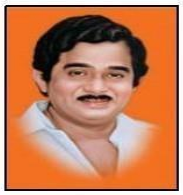

Department of Electronics & Communication Engineering

III B. Tech – II Semester						
S.No	**Code**	**Courses**	**Hours per week**			**Credits**
			L	**T**	**P**	**C**
1		Microprocessor And Microcontrollers	**3**	**0**	**0**	**3**
2		VLSI Design	**3**	**0**	**0**	**3**
3		Digital Signal Processing	**3**	**0**	**0**	**3**
4	PE-II	**Professional Elective-II** 1. Microwave Engineering 2. Mobile & Cellular Communication 3. Embedded Systems 4. CMOS Analog IC Design	**3**	**0**	**0**	**3**
5	OE-II	**Open Elective-II** 1. Computer networks 2. Fundamentals of Utilization of electrical energy 3. Indian Electricity ACT	**3**	**0**	**0**	**3**
6		Microprocessor And Microcontrollers - Lab	**0**	**0**	**3**	**1.5**
7		VLSI Design - Lab	**0**	**0**	**3**	**1.5**
8		Digital Signal Processing -Lab	**0**	**0**	**3**	**1.5**
9		**Skill Oriented Course - IV** 1. Mini Project	**0**	**0**	**4**	**2**
10		Employability Skills-II	**2**	**0**	**0**	**0**
Total credits						**21.5**

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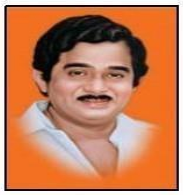
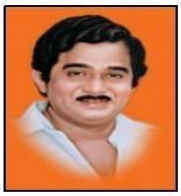


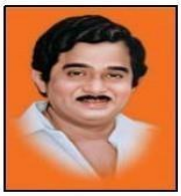
Department of Electronics & Communication Engineering

IV B. Tech –I Semester						
S.No	**Course Code**	**Course Title**	**Hours per week**			**Credits**
			L	**T**	**P**	**C**
1	PE-III	**Professional Elective-III** 1. Optical Communication 2. Digital Image Processing 3. Low Power VLSI Design	**3**	**0**	**0**	**3**
2	PE-IV	**Professional Elective-IV** 1. Radar Engineering 2. Pattern Recognition & Machine Learning 3. Satellite Communications	**3**	**0**	**0**	**3**
3	PE-V	**Professional Elective-V** 1. Internet of Things 2. Soft Computing Techniques 3. Digital IC Design Using CMOS	**3**	**0**	**0**	**3**
4	OE-III	**Open Elective-III** 1. Smart manufacturing 2. Power System Engineering 3. Artificial neural networks	**3**	**0**	**0**	**3**
5		IOT Programming	**0**	**0**	**4**	**2**
6	OE-IV	**Open Elective-IV** 1. Fundamentals of Elective Vehicles 2. Concept of Smart Grid Technology 3. Block Chain Architecture Design And Use Cases	**3**	**0**	**0**	**3**
7		Universal Human Values 2: Understanding Harmony	**3**	**0**	**0**	**3**
8		**Industrial/Research Internship 2 months (Mandatory) after third year (to be evaluated during VII semester**	**0**	**0**	**0**	**3**
Total credits						**23**



Department of Electronics & Communication Engineering

IV B. Tech –II Semester						
S.No	**Course Code**	**Course Title**	**Hours per week**			**Credits**
			L	**T**	**P**	**C**
3	21EC4261	Major Project Work, Seminar Internship	-	-	-	**12**
Total credits						**12**



Department of Electronics & Communication Engineering

II Year I Semester		L	T	P	C
		3	0	0	3
TRANSFORM TECHNIQUES (Common to All Branches)					

Course objectives:

1. To familiarize the techniques in partial differential equations
2. To furnish the learners with basic concepts and techniques sat plus two level to lead them into advanced level by handling various real-world application

COURSE OUTCOMES:
At the end of the course, the student will learn

1. Apply The Laplace Transform For Solving Differential Equations.
2. Find Or Compute the Fourier series Of Periodic Signals.
3. Know And Be Able To Apply Integral Expressions For The Forwards And Inverse Fourier Transform To Arrange Of Non-Periodic Wave Forms.
4. Identify Solution Methods For Partial Differential Equations That Model Physical Processes.
5. To Know The Solution Of Second And Higher Order Partial Differential Equations.

UNIT I: Laplace Transforms:
Laplace Transforms Of Standard Functions – Properties -Shifting Theorems – Transforms Of Derivatives And Integrals – Inverse Laplace Transforms– Convolution Theorem (Without Proof).
Applications: Solving Ordinary Differential Equations (Initial Value Problems) Using Laplace Transforms

UNIT II: Fourier series:
Introduction – Periodic Functions – Fourier Series Of Periodic Function –Dirichlet's Conditions – Even And Odd Functions – Change Of Interval – Half-Range Sine And Cosine Series.

UNIT-III: Fourier Transforms:
Fourier Integral Theorem (Without Proof) –Fourier Sine and Cosine Integrals –Sine and Cosine Transforms –Inverse Transforms –Finite Fourier Transforms

UNIT IV: PDE of first order:

Formation of Partial Differential Equations by Elimination of Arbitrary Constants and Arbitrary Functions – Solutions of First Order Linear (Lagrange) Equation and Nonlinear (Standard Types) Equations.

UNIT V: Second order PDE and Applications:

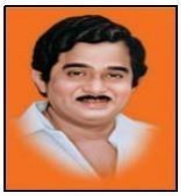
Second Order PDE: Solutions Of Linear Partial Differential Equations With Constant Coefficient –RHS Term Of The Typee^{ax+by}, $\sin(ax + by)$, $\cos(ax + by)$, $x^m y^n$,Method Of Separation Of Variables. Application: One Dimensional Wave Equation.

TEXT BOOKS:

1. B.S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. B.V.Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc.Graw Hill Education

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10thedition, Wiley-India.
2. Peter O'Neil Advanced Engineering Mathematics, Cengage.



Department of Electronics & Communication Engineering

II Year – I Semester		L	T	P
		3	0	0
Electronics Devices and Circuits				

Course objectives:

The Main Objectives of This Course Are

1. To Learn And Understand The Basic Concepts Of Semi Conductor Physics.
2. Study The Physical Phenomena Such As Conduction, Transport Mechanism And ElectricalCharacteristics Of Different Diodes.
3. To Learn And Understand The Application Of Diodes As Rectifiers With Their Operation And Characteristics With And Without Filters Are Discussed.
4. Acquire Knowledge About The Principle Of Working And Operation Of Bipolar JunctionTransistor And Field Effect Transistor And Their Characteristics.
5. To Learn And Understand The Purpose Of Transistor Biasing And Its Significance.
6. Small Signal Equivalent Circuit Analysis Of BJT And FET Transistor Amplifiers AndCompare Different Configurations.

Course Outcomes:

At The End of This Course the Student Will Be Able To

1. Apply The Basic Concepts Of Semi Conductor Physics.
2. Understand The Formation Of P-N Junction And How It Can Be Used As A P-N Junction As Diode In Different Modes Of Operation.
3. Know The Construction, Working Principle Of Rectifiers With And Without Filters With Relevant Expressions And Necessary Comparisons.
4. Understand The Construction, Principle Of Operation Of Transistors, BJT And FET With Their V-I Characteristics In Different Configurations.
5. Know the Need of Transistor Biasing, Various Biasing Techniques for BJT and FET and Stabilization Concepts with Necessary Expressions.

UNIT-I:

JUNCTION DIODE CHARACTERISTICS:

Energy Band Diagram Of PN Junction Diode, Open Circuited P-N Junction, Biased P-N Junction, P-N Junction Diode, Current Components In PN Junction Diode, Diode Equation, V-I Characteristics, Temperature Dependence On V- I Characteristics, Diode Resistance, Diode Capacitance.

SPECIAL SEMICONDUCTOR DEVICES:

Zener Diode, Breakdown Mechanisms, Zener Diode Applications, LED, Varactor Diode, Photo Diode, Tunnel Diode, UJT, PN-PN Diode, SCR. Construction, Operation and V-I Characteristics.

UNIT-II:

RECTIFIERS AND FILTERS:

Basic Rectifier Setup, Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Derivations Of Characteristics Of Rectifiers, Rectifier Circuits-Operation, Input And Output Waveforms, Filters, Inductor Filter(Series Inductor), Capacitor Filter(Stunt Inductor), Π-Filter, Comparison Of Various Filter Circuits In Terms Of Ripple Factors.

UNIT-III:

Bipolar Junction Transistor: BJT-Construction and Types, Different Regions Of Operations; Transistor Current Components-Emitter Efficiency, Transport Factor, Large Signal Current Gain; Input And Output Characteristics Of Transistor Configurations; Relation Between A, B And Γ; Ebers-Moll Model.

UNIT- IV: FET: FET Types, Construction, Operation, Characteristicsμ, Gm, Rd Parameters, MOSFET-Types, Construction, Operation, Characteristics, Comparison between JFET and MOSFET.

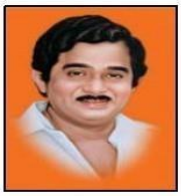
UNIT-V: BJT Biasing: Need For Biasing; Operating Point, DC Load Line, AC Load Line And Stability Factors S,S' And S''; Biasing Circuits- Fixed Bias, Collector To Base Bias And Self Bias; Thermal Runaway And Thermal Stability, Bias Compensation Techniques. FET Biasing: Voltage Divider Bias, Small Signal Equivalent of FET.

Text Books:

1. Electronic Devices And Circuits-J.Millman, C.Halkias, Tatamc-Grawhill, Second Edition, 2007
2. Electronic Devices and Circuits-K. Lal Kishore, BS Publications, Fourth Edition, 2016.
3. Electronics Devices & Circuit Theory-Robert L.Boylestad And Loui Nashelsky, Pearson / Prenticehall, Tenthedition, 2009

References:

1. Integrated Electronics-J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition, 2009
2. Electronic Devices And Integrated Circuits – B.P. Singh, Rekha , Pearson Publications
3. Electronic Devices and Circuits-Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, 4thedition, 2008.



Department of Electronics & Communication Engineering

II Year – I Semester		L	T	P	C
		3	0	0	3

Signals & Systems

Course Objectives:

The Main Objectives Of This Course Are Given Below:

1. To Study about Signals and Systems.
2. To Analyze the Spectral Characteristics of Signal Using Fourier series And Fourier Transforms.
3. To Understand The Characteristics Of Systems.
4. To Introduce The Concept Of Sampling Process
5. To Know Various Transform Techniques To Analyze The Signals And Systems.

Course Outcomes: At the end of this course the student willable to:

1. Classify The Signals And Various Operations On Signals.
2. Determine The Response Of LTI System To An Arbitrary Input Signal Using Convolution
3. Analyze The Spectral Characteristics of Signals Using Fourier series And Fourier Transforms.
4. Apply The Various Sampling Techniques On Continuous Time Signals.
5. Applytheconceptsoflaplacetransform/Z-Transformtoanalyzecontinuous-
6. Time/Discrete-Time Signal Sin Complex Plane

UNIT-I: INTRODUCTION:

Definition of Signals and Systems, Classification of Signals, Classification of Systems, Operations on Signals: Time-Shifting, Time-Scaling, Amplitude-Shifting, Amplitude-Scaling. Complex Exponential and Sinusoidal Signals, Singularity Functions and Related Functions: Impulse Function, Step Function Signum Function and Ramp Function.Orthogonal Signal Space, Signal Approximation Using Orthogonal Functions, Mean Square Error, Related Problems.

UNIT–II: FOURIER SERIES AND FOURIER TRANSFORM:

Fourier Series Representation Of Continuous Time Periodic Signals, Properties Of Fourier Series, Dirichlet's Conditions, Trigonometric Fourier Series And Exponential Fourier Series, Relation Between Trigonometric And Exponential Fourier Series. Fourier Transform Of Basic Signals, Fourier Transform Of Standard Signals, And Properties Of Fourier Transforms.

UNIT-III: ANALYSIS OF LINEAR SYSTEMS:

Introduction**,** Linear System, Impulse Response, Response Of A Linear System, Linear Time Invariant (LTI) System, Linear time variant(LTV) System, Concept of convolution in time domain and frequency domain, Graphical Representation Of Convolution, Transfer Function

Of A LTI System, Related Problems. Relation between Convolution and Correlation. Auto-Correlation and Cross-Correlation of Functions.

UNIT–IV: SAMPLING THEOREM:

Sampling, Necessity Of Sampling, Types Of Sampling, Impulse Sampling, Natural And Flat Top Sampling, Aperture Effect, Reconstruction Of Signal From Its Samples, Effect Of Under Sampling–Aliasing, Related Problems.

UNIT–V: LAPLACE TRANSFORMS:

Introduction**,** Concept Of Region Of Convergence (ROC) For Laplace Transforms, Properties Of L.T's, Inverse Laplace Transform, Relation Between L.T's, And F.T. of A Signal.

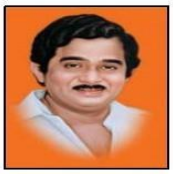
Z–TRANSFORMS: Concept of Z-Transform of a Discrete Sequence. Region of Convergence in Z-Transform, Inverse Z-Transform, Properties of Z-Transforms. Distinction Between Laplace, Fourier And Z Transforms.

TEXTBOOKS:

1. Signals, Systems &Communications-B.P.Lathi, BS Publications, 2003.
2. SignalsandSystemsA.V.Oppenheim,A.S.WillskyandS.H.Nawab,PHI,2nd Edn,1997
3. Signals Systems-Simon Haykin and VanVeen, Wiley, 2ndEdition,2007

REFERENCEBOOKS:

1. PrinciplesofLinearSystemsandSignals–BPLathi,OxfordUniversityPress,2015
2. Signals and Systems–TKRawat, OxfordUniversitypress,2011
3. Signals and Systems – Anand Kumar, PHI



Department of Electronics & Communication Engineering

II Year – I Semester		L	T	P
		3	0	0
SWITCHING THEORY AND LOGIC DESIGN				

Course Objectives:

1. To Solve A Typical Number Base Conversion And Analyze New Error Coding Techniques.
2. Theorems and Functions of Boolean algebra And Behavior of Logic Gates.
3. To Optimize Logic Gates For Digital Circuits Using Various Techniques.
4. Boolean Function Simplification Using Karnaugh Maps and Quine-Mccluskey Methods.
5. To Understand Concepts Of Combinational Circuits.
6. To Develop Advanced Sequential Circuits.

Course outcomes:
At the end of the course student will be able to:

1. Explain The Different Types Of Number Systems, Number Conversions, Codes And Logic Gates.
2. Apply the Concepts of Boolean algebra And Use the Knowledge of K-Maps and Tabular Method for Minimization of Boolean Expressions.
3. Construct The Higher Order Modules From Their Lower Order Structures Of Various M Combinational Logic Circuits.
4. Explain The Concept Of Various Flip Flops.
5. Develop Various Sequential Circuits Like Registers, Counters And Various Finite State Machine Models.

UNIT– I:

NUMBER SYSTEMS & CODES:

Representation of Numbers of Different Radix, Conversation from One Radix to another Radix, R and (R-1) 'S Compliment of Signed Members. Basic Logic Operations -NOT, OR, AND, Universal Building Blocks, EX-OR, EX-NOR – Gates. Binary Codes: BCD, Excess-3, Gray code, 2421, 84-2-1, Error Detection, Error Correction Codes - Hamming Code

UNIT– II:

MINIMIZATION TECHNIQUES:

Boolean Theorems, Principle Of Complementation & Duality, De-Morgan Theorems, Minimization Of Logic Functions Using Boolean Theorems, Standard SOP And POS, Forms, NAND- NAND And NOR-NOR Realizations, Minimization Of Switching Functions Using K-Map Up To 5 Variables, Tabular Minimization.

UNIT– III:

COMBINATIONAL LOGIC CIRCUITS DESIGN:

Half Adder, Full Adder, Half Subtractor, Full Subtractor, Ripple Carry Adder And Subtractor, 4 Bit Binary Adder-Subtractor Circuit, BCD Adder Circuit, Excess 3 Adder Circuit, Design Of Decoder, Demultiplexers, 7 Segment Decoder, Implementation Of Higher Order Circuits Using Lower Order Circuits For MUX, DEMUX, DECODER, Realization Of Boolean Functions Using

Decoders And Multiplexers, Priority Encoder.

UNIT– IV:

SEQUENTIAL CIRCUITS –I:

Classification of Sequential Circuits (Synchronous and Asynchronous); Basic Flip-Flops, Truth Tables and Excitation Tables (NAND RS Latch, Nor RS Latch, RS Flip-Flop, JK Flip-Flop, T Flip-Flop, D Flip-Flop with Reset and Clear Terminals). Asynchronous Inputs (Preset and linear), Race around Condition, Master Slave JK Flip Flop, Conversion from One Flip-Flop to another Flip-Flop.

UNIT–V:

SEQUENTIAL CIRCUITS –II:

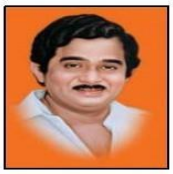
Design of Ripple Counters, Design of Synchronous Counters, Johnson Counter, Ring Counter. Design of Registers – Buffer Register, Control Buffer Register, Shift Register, Bi-Directional Shift Register, Universal Shift Register. Finite State Machine: Introduction to Mealy and Moore Finite State Machines

Text Books:

1. Digital Design by M. Morris Mano, Michael D. Ciletti,PEA.
2. Fundamentals of Logic Design, 5/e Roth,Cengage.
3. Modern Digital Electronics by RP Jain,

THE REFERENCE BOOKS:

1. An Engineering Approach to Digital Design, William I. Fletcher, Pearson edition.
2. Switching Theory and Logic Design by A. Anand Kumar
3. Switching & Finite Automata Theory, 2nd Edition, ZviKohavi, TMH, 1978.



Department of Electronics & Communication Engineering

II Year – I Semester		L	T	P	C
		3	0	0	3

Control Systems

Course objectives:

1. To introduce the concepts of open loop and closed loop systems, mathematical models of mechanical and electrical systems, and concepts of feedback
2. To study the characteristics of the given system in terms of the transfer function and introducing various approaches to reduce the overall system for necessary analysis
3. To develop the acquaintance in analyzing the system response in time-domain and frequency domain in terms of various performance indices
4. To analyze the system in terms of absolute stability and relative stability by different approaches
5. To design different control systems for different applications as pergiven specifications
6. To introduce the concepts of state variable analysis, design and also the concepts of controllability and Observability.

Course Outcomes:
After successful completion of this course, students will be able to

1. Determine the Mathematical Modeling of Physical Systems
2. Calculation of Time Domain Specification of First and Second Order Systems and Understand the Effect of Controllers
3. Investigate The Stability Of Closed Loop Systems Using Routh‟S Stability Criterion And Root Locus Method.
4. Find The Stability Of Control Systems Using Frequency Response Approaches.
5. Analyze Physical Systems Using State Space Approach**.**

Unit – I:
Mathematical Modeling of Control Systems
Classification Of Control Systems, Open Loop And Closed Loop Control Systems And Their Differences, Feed-Back Characteristics, Transfer Function Of Linear System, Differential Equations Of Electrical Networks, Translational And Rotational Mechanical Systems, Transfer Function of Dc Servo Motor - Ac Servo Motor- Synchro, Transmitter And Receiver - Block Diagram Algebra – Representation By Signal Flow Graph - Reduction Using Mason‟S Gain Formula.

Unit-II:
Time Response Analysis
Standard Test Signals - Time Response of First and Second Order Systems - Time Domain Specifications - Steady State Errors and Error Constants – Effects of Various Controllers (P, PI, PD and PID Controllers) On a System.

Unit –III:
Stability and Root Locus The concept of stability –Routh‟s stability criterion –Relative stability– limitations of Routh‟s stability –Root locus concept - construction of root loci. Technique

Unit–IV:

Frequency Response Analysis

Introduction to Frequency Domain Specifications-Bode Diagrams- Transfer Function From the Bode Diagram-Phase Margin and Gain Margin-Stability Analysis From Bode Plots, Polar Plots, Nyquist Stability Criterion.

Unit–V:

State Space Analysis of LTI Systems

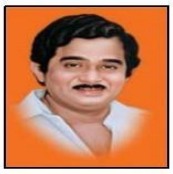
Concepts Of State, State Variables And State Model, State Space Representation Of Transfer Function, Diagonalization- Solving The Time Invariant State Equations- State Transition Matrix And It's Properties – Concepts Of Controllability And Observability.

Text Books:

1. Control Systems Principles and Design, M. Gopal, Tata Mcgraw Hill Education Pvt Ltd., 4th Edition, 2014.
2. Automatic Control Systems, Benjamin C. Kuo, Prentice Hall of India, 2ndedition, 2014.

Reference Books:

1. Modern Control Engineering, Kotsuhiko Ogata, Prentice Hall Of India, 2002.
2. Control Systems, Manikdhanesh N, Cengage Publications, 2012.
3. Control Systems Engineering, I.J.Nagarath and M.Gopal, Newage International Publications, 5th Edition, 2007.
4. Control Systems Engineering, S.Palani, Tata Mcgraw Hill Publications, 2009.



Department of Electronics & Communication Engineering

II Year – I Semester		L	T	P	C
		0	0	3	1.5
ELECTRONIC DEVICES AND CIRCUITS LAB					

Note: The students are required to perform the experiment to obtain the V-I characteristicsand to determine the relevant parameters from the obtained graphs.

List of Experiments:

(Minimum of Ten Experiments has to be performed)

1. P-N Junction Diode Characteristics
2. Part A: Germanium Diode (Forward bias& Reverse bias) Part B: Silicon Diode (Forward Bias only)
3. Zener Diode Characteristics
4. Part A: V-I Characteristics
5. Part B: Zener Diode as Voltage Regulator
6. Rectifiers (without and with c-filter) Part A: Half-wave Rectifier
7. Part B: Full-wave Rectifier
8. BJT Characteristics (CE Configuration) Part A: Input Characteristics
9. Part B: Output Characteristics
10. FET Characteristics (CS Configuration) Part A: Drain Characteristics
11. Part B: Transfer Characteristics
12. SCR Characteristics
13. UJT Characteristics
14. Transistor Biasing
15. CRO Operation and its Measurements
16. BJT-CE Amplifier
17. Emitter Follower-CC Amplifier
18. FET-CS Amplifier

Equipment required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multi-meters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Component

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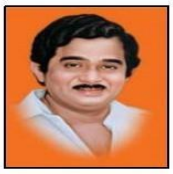

Department of Electronics & Communication Engineering

II Year – I Semester		L	T	P	C
		0	0	3	1.5
SWITCHING THEORY AND LOGIC DESIGN LAB					

LIST OF EXPERIMENTS:

(MINIMUM OF TWELVE EXPERIMENTS HAS TO BE PERFORMED)

1. Verification Of Truth Tables Of Logic Gates
2. Two Input (I) OR (Ii) AND (Iii) NOR (Iv) NAND (V) Exclusive OR
3. (Vi) Exclusive NOR
4. Design A Simple Combinational Circuit With Four Variables And Obtain Minimal SOP Expression And Verify The Truth Table Using Digital Trainer Kit
5. Verification Of Functional Table Of 3 To 8 Line Decoder/De-Multiplexer
6. Variable Logic Function Verification Using 8 To1 Multiplexer.
7. Design Full Adder Circuit And Verify Its Functional Table.
8. Verification Of Functional Tables Of
9. JK Edge Triggered Flip–Flop (Ii) JK Master Slav Flip–Flop (Iii) D flip-Flop
10. Design A Four Bit Ring Counter Using D Flip–Flops/JK Flip Flop And Verify Output
11. Design A Four Bit Johnson's Counter Using D Flip-Flops/JK Flip Flops And Verify Output
12. Verify The Operation Of 4-Bit Universal Shift Register For Different Modes Of Operation.
13. Draw The Circuit Diagram Of MOD-8 Ripple Counter And Construct A Circuit Using T-Flip- Flops And Test It With A Low Frequency Clock And Sketch The Output Wave Forms.
14. Design MOD–8 Synchronous Counter Using T Flip- Flop And Verify The Result And Sketch The Output Wave Forms.
15. (A) Draw The Circuit Diagram Of A Single Bit Comparator And Test The Output
16. (B) Construct 7 Segment Display Circuit Using Decoder And 7 Segments LED And Test It.

ADD on Experiments:

1. Design BCD Adder Circuit And Test The Same Using Relevant IC
2. Design Excess-3 To 9-Complement Convertor Using Only Four Full Adders And Test The Circuit.
3. Design An Experimental Model To Demonstrate The Operation Of 74154 De-Multiplexer Using Leds For Outputs.

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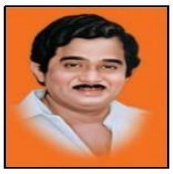

Department of Electronics & Communication Engineering

II Year – I Semester		L	T	P	C
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BASIC SIMULATION LABORATORY					

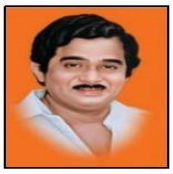
Course Outcomes:

1. Upon Completing This Course, The Students Will Be Able To
2. Generate, Analyze And Perform Various Operations On Signals/Sequences Both In Time And Frequency Domain
3. Analyze And Characterize Continuous And Discrete Time Systems Both In Time And Frequency Domain Along With The Concept Of Sampling
4. Generate Different Random Signals And Capable To Analyze Their Characteristics
5. Apply The Concepts Of Deterministic And Random Signals For Noise Removal Applications And On Other Real Time Signals

Note: All the experiments are to be simulated using MATLAB or equivalent software•
Minimum of 10-12 experiment are to be completed•

List of Experiments:

1. Basic Operations on Matrices.
2. Generation of Various Signals and Sequences (Periodic and Aperiodic), Such As Unit Impulse, Unit Step, Square, Saw Tooth, Triangular, Sinusoidal, Ramp, Sinc.
3. Operations On Signals And Sequences Such As Addition, Multiplication, Scaling, Shifting, Folding, Computation Of Energy And Average Power.
4. Finding The Even And Odd Parts Of Signal/Sequence And Real And Imaginary Parts Of Signal.
5. Convolution for Signals and Sequences.
6. Auto Correlation and Cross Correlation for Signals and Sequences.
7. Verification of Linearity and Time Invariance Properties of a Given Continuous/Discrete System.
8. Computation of Unit Sample, Unit Step and Sinusoidal Responses of the Given LTI System and Verifying Its Physical Realiazability and Stability Properties.
9. Gibbs Phenomenon Simulation.
10. Finding The Fourier Transform Of A Given Signal And Plotting Its Magnitude And Phase Spectrum.
11. Waveform Synthesis Using Laplace Transform.
12. Locating The Zeros And Poles And Plotting The Pole-Zero Maps In S-Plane And Z-Plane For The Given Transfer Function.
13. Generation of Gaussian Noise (Real and Complex), Computation of Its Mean, M.S. Value and Its Skew, Kurtosis, and PSD, Probability Distribution Function.
14. Verification of Sampling Theorem.
15. Removal of Noise by Autocorrelation / Cross Correlation.
16. Extraction of Periodic Signal Masked By Noise Using Correlation.
17. Verification of Weiner-Khinchine Relations.
18. Checking a Random Process For Stationarity In Wide Sense.



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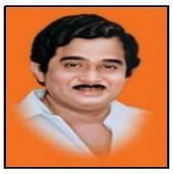
Major Equipment required for Laboratories:

1. Computer System With Latest Specifications Connected
2. Window Xp Or Equivalent
3. Simulation Software-MAT Lab Or Any Equivalent Simulation Software



Department of Electronics & Communication Engineering

II Year – I Semester		L	T	P	C
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PCB DESIGNING (SKILL ORIENTED COURSE)

Course Outcomes:

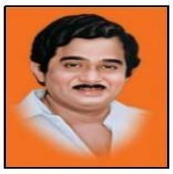
At the end of the Course the student will be able to

1. Determine appropriate components to make circuits.
2. Interpret test results and measurements on electric circuits.
3. Analyze the fabrication processes of printed circuit boards.
4. Apply the software and hardware for PCB Design.
5. Evaluate an electronic printed circuit board for a specific application using industry standard software.

List of experiments:

1. Study on types of PCB layers, through Hole and SMD Components.
2. Schematic Creation and simulation of an electronic circuit
3. Mapping Components of an electronic circuit
4. Set Parameters for PCB Design.
5. Laying Tracks on PCB.
6. Create PCB Layout of an Electronic Circuit.
7. Create Device Model and simulation.
8. Create PCB layout of an amplifier design.
9. Create PCB layout of an Astable Multivibrator using IC's.
10. Create PCB layout of a Voltage Regulator using IC's.
11. Create PCB layout of a Galvanic isolation circuit.
12. Printing on PCB.
13. Etching and Drilling of PCB.
14. Soldering PCB.
15. Testing of an electronic Circuit-1 on PCB.
16. Testing of an electronic Circuit-2 on PCB.

Note: Any TWELVE of the experiments are to be conducted



Department of Electronics & Communication Engineering

II Year – II Semester		L	T	P	C
		3	0	0	3

ANALOG COMMUNICATIONS

Course Objectives:

1. Students undergoing this course are expected to
2. Familiarize with the fundamentals of analog communication systems.
3. Familiarize with various techniques for analog modulation and demodulation of signals.
4. Distinguish the figure of merits of various analog modulation methods.
5. Develop the ability to classify and understand various functional blocks of radio transmitters and receivers.
6. Familiarize with basic techniques for generating and demodulating various pulse modulated signals.

Course outcomes

1. Upon successful completion of the course, the student will be able to
2. Understand the generation and detection of continuous signals using different modulation techniques.
3. Comprehend the working principles of radio transmitters and receivers
4. Analyze the noise performance of AM & FM receivers

UNIT-I

Amplitude Modulation: Time domain description, Frequency Domain Description, Generation of AM waves, Detection of AM waves. Double Side Band-Single Carrier Modulation: Time and Frequency Domain Description, Generation of DSBSC waves, Coherent detection of DSBSC Modulated Waves, Costas Loop.

UNIT-II

SSB &VSB Modulations: Single Side Band Modulation: Frequency Domain Description, Generation of SSB-SC Wave, Frequency- Discrimination Method, Phase Discrimination method, Demodulation of SSB-SC Waves, Vestigial Side-Band Modulation, Frequency Domain Description, Generation of VSB Modulated Wave, Envelope Detection of VSB Wave Plus Carrier.

UNIT-III

Angle Modulation: Frequency Modulation: Single Tone Frequency
Modulation, Spectrum Analysis, Narrow Band FM, Wideband FM, Transmission Bandwidth of FM, Generation of FM Waves, Demodulation of FM Waves, Phase Locked Loop (PLL) Limiting IFFM Waves, Applications of FM Waves.

Pulse Modulation: Basic principles of PAM, PWM, PPM-Generation and Detection techniques

UNIT-IV

Radio Transmitters: Classification of Radio Transmitters, AM Radio Transmitters, Carrier frequency requirements of Radio Transmitter, Master Oscillator, Methods of frequency modulation, Armstrong FM Transmitter.

Radio Receivers: Receiver Types, AM Receivers**,** FM Receivers- Comparison with AM Receivers, Amplitude limiting, Basic FM demodulators, Radio detector

UNIT-V

Noise in Analog Modulation: AM Receiver model, Signal to Noise Ratios for Coherent Reception. Noise in AM receivers using Envelope Detection. FM receiver model, Noise in FM reception, Threshold Effect, Pre-emphasis and De-emphasis in FM.

Text Books:

1.Simon Haykin. "Introduction to Analog and Digital Communication Systems", 2nd edition, John Wiley and Sons, 2009. (Units - I, II &III)
2.George Kennedy & Bernard Davis, "Electronic Communicationsystems", 4th edition, TMH India, 2009.

References:

1.G. K. Mithal, "Radio Engineering", 20th edition, Khanna Publishers,2011. (Unit - IV)
2.Taub and Schilling, "Principles of Communication Systems", 2ndedition, TMH, 2004.
3.A Bruce Carlson, PB Crilly, JC Rutledge, "CommunicationSystems", 4th Edition, McGraw Hill, New York, 2002.

E Resources:

1. http://nptel.iitm.ac.in/viedo.php?subjectId=117102059

http://web.engr.oregonstate.edu/~magana/ECE461-561/index.htm

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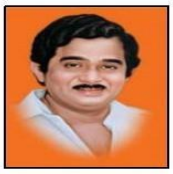

Department of Electronics & Communication Engineering

		L	T	P	C
II Year – II Semester		**3**	**0**	**0**	**3**

LINEAR INTEGRATED CIRCUITS ANDAPPLICATIONS

Course outcomes

1. Understand the basic concepts of Differential Amplifier circuits
2. Able to design filter circuits for specific applications
3. Understand the basics of analog to digital converters (ADC), and digital to analog converters (DAC) and Gain knowledge in designing a stable voltage regulators
4. Understand the applications of PLL and special ICs.

UNIT - I

Operational Amplifier: Introduction, Basic Information of Op- amp, the ideal Operational Amplifier, Operational Amplifier Internal Circuit, FET Operational Amplifier. Operational amplifier characteristics: DC characteristics, AC characteristics. Operational amplifier Applications: Basic Op-amp Applications, Instrumentation Amplifier, Op-amp Circuits using Diodes, Sample and Hold Circuits, Log and Antilog amplifier, Differentiator, Integrator.

UNIT – II

Comparators and Waveform Generators: Introduction, Comparator, Regenerative Comparator (Schmitt Trigger), Square Wave Generator (Astable Multivibrator), Monostable Multivibrator, Triangular Wave Generator, Basic Principles of Sine Wave Oscillators. Active Filters: Introduction, RC active filters, Transformations, State Variable Filter

UNIT – III

D-A and A-D Converters: Introduction, Basic DAC Techniques A- D Converters, DAC/ADC specifications

Voltage Regulators: Introduction, Series Op-amp Regulator, General Purpose Regulator, Switching regulator, IC Voltage Regulators, 723 General Purpose Regulators

UNIT – IV

Applications of Special ICs:

555 Timer: Introduction, Description of Functional Diagram, Monostable operation, Astable Operation, Schmitt Trigger.

UNIT – V

Phase Locked Loops: Introduction, Basic Principles, Phase Detector/Comparator, and Voltage Controlled Oscillator (566), Low Pass Filter, Monolithic PLL (565), PLL Applications.

Text Books:

1. D. Roy Choudhary, Shail Jain, "Linear Integrated Circuits", 4th edition, New Age International Pvt. Ltd., 2010.

Reference Books

1. 1. Ramakant A. Gayakwad, "OP-AMPs and Linear Integrated Circuits", 4th edition, Prentice Hall, 2000.
2. Sergio Franco, "Design with operational amplifiers and analog integrated circuits", 3rd edition. McGraw-Hill, 2002.

E-resources and other digital material Freevideolectures.com › Electrical Engineering › UC Berkeley

nptel.ac.in/courses/122104013/main1.html

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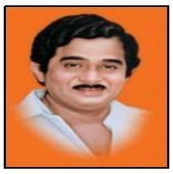


Department of Electronics & Communication Engineering

II Year – II Semester		L	T	P	C
		3	0	0	3

ELECTRONIC CIRCUIT ANALYSIS

The main objectives of this course are:

1. Small signal low and high frequency BJT transistor amplifier models and the expressions for the respective parameters are derived.
2. Cascading of single stage amplifiers is discussed. Expressions for overall voltage gain are derived.
3. The concept of feedback is introduced. Effect of negative feedback on amplifier characteristics is explained and necessary equations are derived.
4. Basic principle of oscillator circuits is explained and different oscillator circuits are given with their analysis.
5. Power amplifiers Class A, Class B, Class C, Class AB and other types of amplifiers are analyzed.

Outcomes:

1. At the end of this course the student can able to:
2. Design and analyze the small signal low and high frequency transistor amplifier using BJT
3. Design and analysis of multi stage amplifiers using BJT and FET and Differential amplifier using BJT
4. Identify and analyze the different feedback topologies.
5. Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concept.
6. Know the classification of the power amplifiers and their analysis with performance comparison.

UNIT-I

Small Signal Transistor Amplifier models: Low Frequency Transistor Amplifier Models: Two port networks, Transistor hybrid model, determination of h-parameters, generalized analysis of transistor amplifier model using h-parameters

High Frequency Transistor Amplifier models: Transistor at high frequencies, Hybrid- π common emitter transistor model, Hybrid π conductance, Hybrid π capacitances, CE short circuit current gain, current gain with resistive load, cut-off frequencies, frequency response and gain bandwidth **product.**

UNIT-II

Multistage Amplifiers : Classification of amplifiers, methods of coupling, cascaded transistor amplifier and its analysis, analysis of two stage RC coupled amplifier, high input resistance transistor amplifier circuits and their analysis-Darlington pair amplifier, Cascode amplifier, Boot-strap emitter follower, Analysis of multi stage amplifiers using FET, Differential amplifier using BJT.

UNIT -III

Feedback Amplifiers : Feedback principle and concept, types of feedback, classification of

amplifiers, feedback topologies, Characteristics of negative feedback amplifiers, Generalized analysis of feedback amplifiers, Performance comparison of feedback amplifiers, Method of analysis of feedback amplifiers.

UNIT-IV

Oscillators: Oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and Wien bridge oscillators with BJT and FET and their analysis, Generalized analysis of LC Oscillators, Hartley and Colpitt's oscillators with BJT and FET and their analysis, Frequency and amplitude stability of oscillators.

UNIT-V

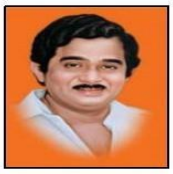
Power Amplifiers: Classification of amplifiers, Class A power Amplifiers and their analysis, Harmonic Distortions, Class B Push-pull amplifiers and their analysis, Complementary symmetry push pull amplifier, Class AB power amplifier, Class-C power amplifier, Thermal stability and Heat sinks, Distortion in amplifiers.

Text Books:

1. Integrated Electronics- J. Millman and C.C. Halkias, Tata Mc Graw-Hill, 2009.
2. Electronic Devices and Circuits- Salivahanan, N.Suressh Kumar, A. Vallavaraj, TATA McGraw Hill, Second Edition

References:

1. Electronic Circuit Analysis and Design – Donald A. Neaman, Mc Graw Hill.
2. Electronic Devices and Circuits Theory – Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, Tenth Edition.



Department of Electronics & Communication Engineering

II Year – II Semester		L	T	P	C
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LINEAR INTEGRATED CIRCUITS &APPLICATIONS LAB

Course outcomes

1. Understand the concepts of linear integrated circuits and special IC's (IC 565, IC 566) and use them for different applications
2. Design oscillators, waveform generators and filter circuits using IC741
3. Use the concepts of A/D , D/A converters and design voltage regulators
4. Design the circuits using 555 timers for particular application

List of Experiments

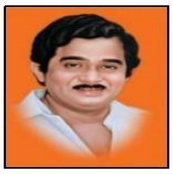
5. Measurement of Op-Amp Parameters
6. Design of a differential amplifier
7. Design and Verification of Applications of Op-amp (Adder, Subtractor, Integrator, Differentiator)
8. Design of Full wave rectifier using 741 IC
9. Design of Instrumentation Amplifier using Op-Amp
10. Design of Triangular waveform generators using 741 IC
11. Design of Monostable and Schmitt Trigger circuit using 741 IC
12. Design of Active Filters using Op-Amp (Second Order LPF & HPF circuits)
13. Design of Voltage Regulator using IC 723
14. Design of 4-bit R – 2R Ladder D-A Converter
15. Verification of Applications of IC 555 Timer (PPM, PWM and FSK)
16. Design a PLL using 556

NB: A minimum of 10(Ten) experiments have to be performedand recorded by the candidate to attain eligibility for External Practical Examination.

1. D.Roy Choudhary, Shail Jain, "Linear Integrated Circuits", 4th edition, New Age International Pvt. Ltd., 2010.
2. Ramakant A.Gayakwad, 'OP-AMP and Linear IC's', Prentice Hall / Pearson Education, 1994.
3. Sergio Franco, 'Design with operational amplifiers and analog integrated circuits', McGraw-Hill, 1997.

E-resourcesand other digital material

1. http://www2.mvcc.edu/~jfiore/et262.html



Department of Electronics & Communication Engineering

II Year – II Semester		L	T	P	C
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ANALOG COMMUNICATIONS LAB					

Course outcomes

1. Experimentally the working of AM, FM and PM techniques and the various parameters involved in it.
2. Experimentally the working of PAM, PWM and PPM techniques and the various parameters involved in it.
3. Experimentally the working of Mixer, Squelch & AGC Circuits.

List of Lab Exercises:

Experiments using Hardware (using Discrete Components):

1. Amplitude Modulation and Demodulation
2. Frequency Modulation and Demodulation
3. DSB SC Modulation and Demodulation
4. SSB SC Modulation and Demodulation
5. Pre Emphasis - De Emphasis Circuits
6. PAM and Reconstruction
7. PWM Generation and Reconstruction
8. Design of Mixer
9. AGC characteristics

Experiments using Software (using Lab VIEW):

1. Amplitude Modulation and Demodulation
2. Frequency Modulation and Demodulation
3. DSB SC Modulation and Demodulation

Experiments using Specialized Equipment (using Spectrum Analyzer):

1. Amplitude Modulation and Demodulation
2. Frequency Modulation and Demodulation

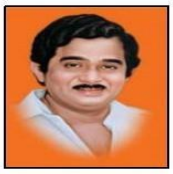
Extra Experiments (Special Circuits):

1. Squelch Circuit
2. Frequency Synthesizer

E-resources and other digital material

1. http://iitg.vlab.co.in/?sub=59&brch=163
2. http://www.scribd.com/doc/27104963/ANLOG- COMMUNICATION Lecture-06

Note: A minimum of 10(Ten) experiments have to be performed and recorded by the candidateto attain eligibility for External Practical Examination.



Department of Electronics & Communication Engineering

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ELECTRONIC CIRCUIT ANALYSIS AND DESIGN LAB WITH SIMULATION

Course Objectives:

1. To prepare students to perform the analysis of any Analog electronics circuit.
2. To empower students to understand the design and working of BJT / FET amplifiers, oscillators and Operational Amplifiers.
3. To evaluate the use of computer based analysis tools to review performance of semiconductor device circuits.
4. Model the electronic circuits using tools such as PSPICE and Multisim.

Course Outcomes:

On completion of this laboratory course, the students will be able to

1. Apply the concepts of amplifier analysis to verify their characteristics and measure the important parameters.
2. Analyze the performance of power amplifiers.
3. Analyze the frequency response and characteristics of operational amplifiers.
4. Simulation and Design of different amplifiers and oscillator circuits.

LIST OF EXPERIMENTS HARDWARE

1. Frequency Response of RC Coupled Amplifier.
2. Frequency Response of Negative Feedback Amplifier
3. Colpitt's Oscillator.
4. RC Phase Shift Oscillator.
5. Wean Bridge Oscillator.
6. Hartley Oscillator.
7. Basic Applications of Operational Amplifier.
8. Tuned Voltage Amplifier.

SOFTWARE:

1. Frequency Response of RC Coupled Amplifier.
2. Frequency Response of Negative Feedback Amplifier
3. Colpitt's Oscillator.
4. RC Phase Shift Oscillator.
5. Wean Bridge Oscillator.
6. Hartley Oscillator.
7. Basic Applications of Operational Amplifier.
8. Tuned Voltage Amplifier.

Reference Books:

1. Lab manual.

E-Resources:

1. https://www.orcad.com/resources/orcad-tutorials

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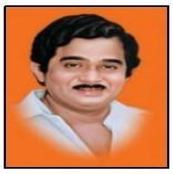

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ARDIUNO PROGRAMMING

(SKILL ORIENTED COURSE)

Course Outcomes:

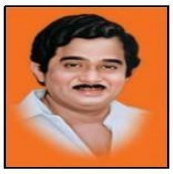
1. To provide knowledge of different smart applications.
2. To familiarize students with Arduino as IDE, programming language & platform.
3. To provide knowledge of Arduino boards and basic components.
4. Develop skills to design and implement various smart applications.

Course Outcomes: On the completion of this laboratory course, the students will be able to

1. Learn the basics of electronics, including reading schematics (electronics diagrams)
2. Learn how to interface sensors with Arduino.
3. Analyze the Arduino Examples along with programming language and IDE.
4. Design Prototype circuits related to real world applications.

LIST OF PROGRAMS

1. Introduction to TINKERCAD Platform.
2. Introduction to Sensors & Other components.
3. Introduction to Arduino Board and its Interfacing.
4. Design a circuit to perform ON/OFF of LED with the help of Bread board.
5. Design a circuit to perform Volume adjustment of Buzzer by using Potentiometer with the help of Bread board.
6. Design a circuit to perform ON/OFF of LED by using Switch with the help of Bread board.
7. Write a program to perform ON/OFF of LED and implement the same with the help of Arduino.
8. Write a program to perform ON/OFF of LED by using Switch & implement the same with the help of Arduino.
9. Write a program to print given text on LCD Display by interfacing it to Arduino.
10. Write a program to interface LDR sensor with Arduino.
11. Write a program to interface Ultrasonic sensor with Arduino.
12. Assignments



Department of Electronics & Communication Engineering

III Year I Semester		L	T	P	C
		3	0	0	3
DIGITAL SYSTEM DESIGN					

Course objects

1. To study the basic philosophy underlying the various number systems, negative number representation, binary arithmetic, theory of Boolean algebra and map method for minimization of switching functions.
2. To introduce the basic tools for design of combinational and sequential digital logic.
3. To learn simple digital circuits in preparation for computer engineering.

Course Outcomes:

1. Interpret the digital logic circuits using CMOS logic.
2. Understand the concepts of HDL languages.
3. Apply VHDL concepts for implementation of digital circuits.
4. Create the digital circuits using Verilog HDL.
5. Apply Continuous Assignment Structures, and Delays and Continuous Assignments.

UNIT-I

CMOS Logic Circuits: CMOS Logic Levels, CMOS Inverter, NAND, NOR, AND, OR, AOI, OAI Circuit Diagrams and Functional Tables. VHDL Hardware Description Language: Design Flow, Program Structure, Types and Constants, Arrays, Functions and Procedures, Libraries and Packages with Examples, Structural. Design Elements, Data Flow Design Elements, Behavioral Design Elements.

UNIT-II

Combinational & Sequential Logic Design using VHDL: Decoders-74x138, 74x139, Encoders-74x148 Priority Encoder, Multiplexers-74x151 MUX, Barrel shifter. Sequential Logic Design using VHDL:8-Bit Latch 74x373,Flip Flops-D Flip Flop74X74,JKFlip Flop74X109, Counters-74x163 4-Bit Binary Counter, 74X163 as Mod-11 and Mod-193 Counter, universal Shift Register 74x194.

UNIT-III

Introduction to Verilog: Verilog as HDL, Levels of Design Description, System Tasks, Programming Language Interface, Test Benches, Language Construct and Conventions. Gate Level Modeling: Introduction, Logic Gate Primitives, Module Structure, Tri-State Gates, Array of Instances of Primitives.

UNIT-IV

Switch level modeling: Introduction, Basic Transistor Switches, CMOS Switch, Bi- directional Gates, Time Delays with Switch Primitives, CMOS NOT, NAND, NOR Gate Using Switch Primitives. Behavioral modeling: Introduction, Operations and Assignments, Functional Bifurcation, Constructs, Assignments with Delays, Wait Construct, Multiple Always Blocks and Designs at Behavioral Level.

UNIT-V

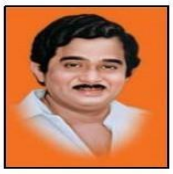
Blocking and Non-blocking: Assignments, Case Statement, and Simulation Flow. Data flow level modeling: Introduction, Continuous Assignment Structures, and Delays and Continuous Assignments, Assignment to Vectors, Operators.

TEXT BOOKS

1. John F. Wakerly, "Digital Design", Principles and Practices, Pearson education, 4th edition
2. T.R. Padmanabhan and B. Bala Tripura Sundari, "Design through Verilog HDL", Wiley IEEE Press.

REFERENCES

1. Charles H. Roth Jr., "Digital System Design Using VHDL", PWS Publications, USA, Reprint 2002.
2. Jan M. Rabaey, AnanthaChandrakasan, and BorivojeNikolic, "Digital Integrated Circuits: A Design Perspective", Prentice Hall Publishers.
3. K. C. Chang, "Digital Systems Design with VHDL and Synthesis: An Integrated Approach", Wiley-IEEE Computer Society Press.
4. Douglas J. Smith, HDL Chip Design, Doone Publications, USA.Michael D.Ciletti, Advanced Digital Design with Verilog HDL,PHI Publishers.
5. J. Bhaskar, A Verilog Primier,BSP Publishers.Bob zeidman, Verilog designers Library, Prentice Hall PTR Publishers



Department of Electronics & Communication Engineering

III Year I Semester		L	T	P	C
		3	0	0	3
ELECTROMAGNETIC WAVES AND TRANSMISSION LINES					

Course Objectives:

1. Fundamentals of steady electric and magnetic fields using various laws
2. Apply the concept of static and time varying Maxwell equations and power flow using pointing theorem
3. Wave characteristics in different media for normal and oblique incidence
4. Implement various concepts of transmission lines and impedance measurements

Course Outcomes:

1. Determine E and H using various laws and applications of electric & magnetic fields
2. Apply the Maxwell equations to analyze the time varying behavior of EM waves
3. Gain the knowledge in uniform plane wave concept and characteristics of uniform plane wave in various media
4. Calculate Brewster angle, critical angle and total internal reflection
5. Derive and Calculate the expressions for input impedance of transmission Lines,reflection coefficient, VSWR etc. using smith chart

UNIT I:

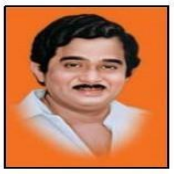
Transmission Lines - I: Types, Parameters, T & π Equivalent Circuits, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line, Lossless lines, distortion less lines, Illustrative Problems.

UNIT II:

Transmission Lines – II: Input Impedance Relations, SC and OC Lines, ReflectionCoefficient, VSWR. Low loss radio frequency lines and UHF Transmission lines, UHF Lines as Circuit Elements; Impedance Trans formations, λ/8, λ/4 and λ /2 Lines. Smith Chart – Construction and Applications, Quarter wave transformer, Single Stub Matching, Illustrative Problems.

UNIT III:

Review of Co-ordinate Systems, **Electrostatics:** Coulomb's Law, Electric Field Intensity, Electric Flux Density, Gauss Law and Applications, Electric Potential, Maxwell's Two Equations for Electro static Fields, Energy Density, Illustrative Problems. Convection and Conduction Currents, Dielectric Constant, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial Capacitors, Illustrative Problems



Department of Electronics & Communication Engineering

UNIT IV:

Magneto Statics: Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magneto static Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Inductances and Magnetic Energy. Illustrative Problems**,**

Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements, Conditions at a Boundary Surface, Illustrative Problems.

UNIT V:

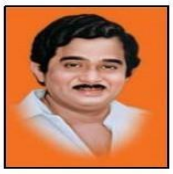
EM Wave Characteristics: Wave Equations for Conducting and Perfect Dielectric Media Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations, Wave Propagation in Lossy dielectrics, lossless dielectrics, free space, wave propagation in good conductors, skin depth, Polarization & Types, Illustrative Problems. Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector and Poynting Theorem, Illustrative Problems.

TEXTBOOKS:

1. Elements of Electromagnetic–Matthew N.O.Sadiku, Oxford Univ. Press, 3rd ed., 2001.
2. Electromagnetic Waves and Radiating Systems – E.C.Jordan and K. G. Balmain, PHI, 2nd Edition, 2000.

REFERENCEBOOKS:

1. Electromagnetic Field Theory and Transmission Lines–SN Raju, Pearson Education2006
2. Engineering Electromagnetic –William H. Hayt Jr. and John A. Buck, TMH, 7th ed., 2006.
3. Electromagnetic Field Theory and Transmission Lines: G Sasi Bhushana Rao, WileyIndia2013.



Department of Electronics & Communication Engineering

III Year I Semester		L	T	P	C
		3	0	0	3
DIGITAL COMMUNICATIONS					

Course Educational Objective:

This course provides the knowledge on different digital modulation techniques. The course provides different concepts on information theory, block codes and convolution codes. It gives the methods of optimum receivers for digital communication systems and performance of probability of error for digital modulation techniques.

Course Outcomes:

1. After going through this course the student will be able to
2. Analyze the performance of a Digital Communication System for probability of error and are able to design a digital communication system.
3. Analyze various source coding techniques.
4. Compute and analyze Block codes, cyclic codes and convolution codes.
5. Design a coded communication system.

UNIT I:

PULSE DIGITAL MODULATION: Elements of digital communication systems, advantages of digital communication systems, Elements of PCM: Sampling, Quantization & Coding, Quantization error, Companding in PCM systems. Differential PCM systems (DPCM), Delta modulation, its draw backs, adaptive delta modulation, comparison of PCM and DM systems, noise in PCM and DM systems

UNIT II:

DIGITAL MODULATION TECHNIQUES: Introduction, ASK, FSK, PSK, DPSK, DEPSK, QPS K, M-ary PSK, ASK, FSK, similarity of BFSK and BPSK.

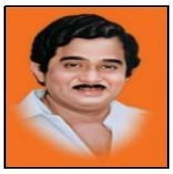
UNIT III:

DATA TRANSMISSION: Base band signal receiver, probability of error, the optimum filter, matched filter, probability of error using matched filter, coherent reception, non coherent detection of FSK, calculation of error probability of ASK, BPSK, BFSK, QPSK.

UNIT IV:

INFORMATION THEORY: Discrete messages, concept of amount of information and its properties. Average information, Entropy and its properties, Information rate, Mutual information and its properties

SOURCECODING: Introductions,Advantages,Shannon'stheorem,ShanonFanocoding,Huff man coding, efficiency calculations, channel capacity of discrete and analog Channels, capacity of a Gaussian channel, bandwidth–S/N trade off.



Department of Electronics & Communication Engineering

UNIT V:

LINEAR BLOCKCODES: Introduction, Matrix description of Linear Block codes, Error detection and error correction capabilities of Linear block codes, Hamming codes, Binary cyclic codes, Algebraic structure, encoding, syndrome calculation, BCH Codes.

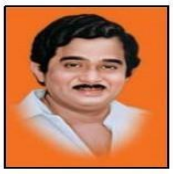
CONVOLUTIONCODES: Introduction, encoding of convolution codes, time domain approach, transform domain approach. Graphical approach: state, tree and trellis diagram decoding using Viterbi algorithm**.**

TEXTBOOKS:

1. Digital communications- Simon Haykin, JohnWiley,2005
2. Digital and Analog Communication Systems -SamShanmugam, JohnWiley, 2005.

REFERENCES:

1. Principles of Communication Systems–H.Tauband D. Schilling, TMH,2003 Digital Communications–John Proakis, TMH, 1983.
2. Communication Systems Analog & Digital– Singh & Sapre, TMH, 2004.
3. Modern Digital and Analog Communication Systems–B.P.Lathi, ZhiDing, Hari Mohan Gupta, Oxford University Press



Department of Electronics & Communication Engineering

III Year –I SEMESTER		L	T	P	C
		3	0	0	3
RENEWABLE ENERGY SOURCES (OPEN ELECTIVE-I)					

Course Objectives:

1. To study the solar radiation data, equivalent circuit of PV cell and its I-V & P-V characteristics.
2. To understand the concept of Wind Energy Conversion & its applications.
3. To study the principles of biomass and geothermal energy.
4. To understand the principles of Ocean Thermal Energy Conversion (OTEC), motion of wave's and power associated with it.
5. To study the various chemical energy sources such as fuel cell and hydrogen energy along with their operation and equivalent circuit.

Course Outcomes:

1. After the completion of the course the student should be able to:
2. Analyze solar radiation data, extra-terrestrial radiation, radiation on earth's surface and solar Energy Storage.
3. Illustrate the components of wind energy systems.
4. Illustrate the working of biomass, digesters and geothermal plants.
5. Demonstrate the principle of Energy production from OTEC, Tidal and Waves.
6. Evaluate the concept and working of Fuel cells & MHD power generation.

UNIT–I

Solar Energy: Introduction - Renewable Sources - prospects, Solar radiation at the Earth Surface - Equivalent circuit of a Photovoltaic (PV) Cell - I-V & P-V Characteristics - Solar Energy Collectors: Flat plate Collectors, concentrating collectors - Solar Energy storage systems and Applications: Solar Pond - Solar water heating - Solar Green house.

UNIT–II

Wind Energy: Introduction - basic Principles of Wind Energy Conversion, the nature of Wind - the power in the wind - Wind Energy Conversion - Site selection considerations - basic components of Wind Energy Conversion Systems (WECS) - Classification - Applications.

UNIT–III

Biomass and Geothermal Energy:

Biomass: Introduction - Biomass conversion technologies - Photosynthesis, factors affecting Bio digestion - classification of biogas plants - Types of biogas plants - selection of site for a biogas plant Geothermal Energy: Introduction, Geothermal Sources – Applications - operational and Environmental problems.

UNIT–IV

Energy from oceans, Waves & Tides:

Oceans: Introduction - Ocean Thermal Electric Conversion (OTEC) – methods - prospects of OTEC in India. Waves: Introduction - Energy and Power from the waves - Wave Energy conversion devices.

Tides: Basic principle of Tide Energy -Components of Tidal Energy.

UNIT–V

Chemical Energy Sources:

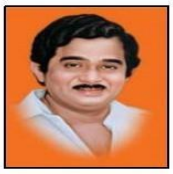
Fuel Cells: Introduction - Fuel Cell Equivalent Circuit - operation of Fuel cell - types of Fuel Cells -Applications. Hydrogen Energy: Introduction - Methods of Hydrogen production - Storage and Applications Magneto Hydro Dynamic (MHD) Power generation: Principle of Operation - Types.

Text Books:

1. G.D.Rai, Non-Conventional Energy Sources, Khanna Publications, 2011.
2. John Twidell & Tony Weir, Renewable Energy Sources, Taylor & Francis, 2013.

Reference Books:

1. S.P.Sukhatme & J.K.Nayak, Solar Energy-Principles of Thermal Collection and Storage, TMH, 2011.
2. John Andrews & Nick Jelly, Energy Science- principles, Technologies and Impacts, Oxford, 2ndedition, 2013.
3. Shoba Nath Singh, Non- Conventional Energy Resources, Pearson Publications, 2015.



Department of Electronics & Communication Engineering

III Year – I SEMESTER		L	T	P	C
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CONCEPTS OF OPTIMIZATION TECHNIQUES (OPEN ELECTIVE-I)					

Course Objectives:

1. To know the importance of adopting optimization techniques in day to day life.
2. To analyze the importance of various types of constraints at various stages.
3. To learn more on linear & nonlinear programming concepts.
4. To analyze the significance of transportation problem.
5. To learn the concepts of dynamic programming.

Course Outcomes:

1. After the completion of the course the student should be able to:
2. State and formulate the optimization problem without and with constraints, also apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints and arrive at an optimal solution.
3. Formulate a mathematical model and apply linear programming technique by using Simplex method. Also extend the concept of dual Simplex method for optimal solutions.
4. Formulate a mathematical model and apply non-linear programming techniques for unconstrained and constrained case studies.
5. Solve transportation and assignment problem by using Linear programming Simplex method.
6. Formulate and apply Dynamic programming technique to inventory control, production planning, engineering design problems etc. to reach a final optimal solution from the current optimal solution.

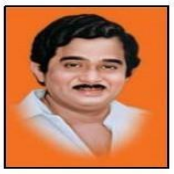
UNIT – I

Introduction to Optimization Techniques

Statement of an Optimization problem – design vector – design constraints – objective function – classification of Optimization problems. Classical Optimization Techniques Single variable Optimization – multi variable Optimization without constraints – Necessary and sufficient conditions for minimum/maximum – multivariable Optimization with equality constraints. Solution by method of Lagrange multipliers.

UNIT – II

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



Department of Electronics & Communication Engineering

UNIT – III

Nonlinear Programming

Unconstrained cases - One – dimensional minimization methods: Classification - Fibonacci method and Quadratic interpolation method - Univariate method - Powell's method. Constrained cases - Characteristics of a constrained problem - Classification -Basic approach of Penalty Function method.

UNIT – IV

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

UNIT – V

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

Text Books:

1. 1. "Engineering optimization: Theory and practice"-by S.S.Rao-New Age International (P) Limited - 3rd edition - 1998.
2. "Introductory Operations Research" by H.S. Kasene& K.D. Kumar - Springer (India) 2013.

Reference Books:

1. K.V. Mital and C. Mohan - New Age International (P) Limited - Publishers - 3rd edition - 1996.
2. Operations Research – by Dr. S.D.Sharma- Kedarnath - Ramnath& Co - 2012.
3. "Operations Research: An Introduction" – by H.A.Taha - PHI pvt. Ltd. - 6th edition Linear Programming–by G.Hadley.

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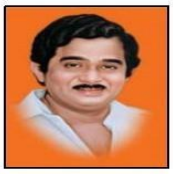

Department of Electronics & Communication Engineering

III Year – I SEMESTER		L	T	P	C
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DATABASE MANAGEMENT SYSTEMS (OPEN ELECTIVE-I)					

Course Objectives:

1. This Course will enable students to
2. introduce about database management systems
3. give a good formal foundation on the relational model of data and usage of Relational
4. Algebra
5. Populate and query a database using SQL DDL/DML Commands
6. Declare and enforce integrity constraints on a database
7. Writing Queries using advanced concepts of SQL
8. Programming PL/SQL including procedures, functions, cursors and triggers
9. introduce the concepts of basic SQL as a universal Database language
10. demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization

Course Outcomes:

1. By the end of the course, the student will be able to Describe a relational database and object-oriented database
2. Create, maintain and manipulate a relational database using SQL Describe ER model and normalization for database design
3. Examine issues in data storage and query processing and can formulate appropriate solutions
4. Outline the role and issues in management of data such as efficiency, privacy, security,
5. ethical responsibility, and strategic advantage
6. Examine integrity constraints to build efficient databases Apply Queries using Advanced Concepts of SQL
7. Build PL/SQL programs including stored procedures, functions, cursors and triggers

UNIT I

Introduction: Database system, Characteristics (Database Vs File System), Database Users (Actors on Scene, Workers behind the scene), Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized And Client Server architecture for the database.

UNIT II

Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, Arithmetic &logical operations, SQL functions (Date and Time, Numeric, String conversion).

UNIT III

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams. Operations.

UNIT IV

SQL: Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view (updatable and non-updatable), relational set

UNIT V

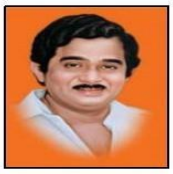
Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-cod normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF), Fifth Normal Form (5NF).

Text Books:

1) Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH
2) Database System Concepts, 5/e, Silberschatz, Korth, TMH
3) Oracle: The Complete Reference by Oracle Press
4) Nilesh Shah, "Database Systems Using Oracle", PHI, 2007
5) Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007

Reference Books:

1) Introduction to Database Systems, 8/e C J Date, PEA.
2) Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA
3) Database Principles Fundamentals of Design Implementation and Management, Carlos Coronel,
4) Steven Morris, Peter Robb, Cengage Learning.



Department of Electronics & Communication Engineering

III Year –I SEMESTER		L	T	P	C
		3	**0**	**0**	**3**
ANTENNAS AND WAVE PROPAGATION (Professional Elective-I)					

Course Objectives:

1) Understand basic terminology and concepts of Antennas.
2) To attain knowledge on the basic parameters those are considered in the antenna design process and the analysis while designing that.
3) Analyze the electric and magnetic field emission from various basic antennas and mathematical formulation of the analysis.
4) To have knowledge on antenna operation and types as well as their usage in real time field.

Course Outcomes (COs):

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

1) 1. Understand basic antenna parameters, radiation mechanism, characteristics of radio wave propagations
2) 2. Analyze wire antenna, ground, space, and sky wave propagation mechanism for communication purpose and various Antenna Arrays
3) 3. Design HF, VHF and UHF Antennas
4) 4. Apply antenna measurement methods to assess antenna's performance

UNIT-I

Antenna Fundamentals: Radiation Mechanism-single wire antenna, Current Distribution on a thin wire antenna, Isotropic Radiators, Directional Antennas, Antenna Parameters**:** Radiation intensity, Radiation Pattern, Total Power radiated, gain, Directivity, Radiation efficiency, Power gain, HPBW, FNBW, effective aperture, effective length, Band Width.

Radiation Fundamentals: Potential functions-heuristic approach, Maxwell's equation approach, Potential functions for sinusoidal oscillations, Analysis of Radiation fields of a Alternating current element, quarter wave Monopole and half wave dipole, Power radiated by current element, Radiation resistance of current element, quarter wave Monopole and half wave dipole.

UNIT-II

Antenna Array Analysis: Various forms of Antenna Arrays, Linear Array of Two Point Sources and N-Point Sources, Expression for electric field from two and N element arrays, Broad-side array and End-Fire array, Method of pattern multiplication, Binomial array, Loop Antenna.

UNIT-III

HF, VHF and UHF Antennas: Resonant Antennas, Non-Resonant Antennas, Helical Antenna, Travelling wave antennas – V Antenna, Inverted V Antenna, Rhombic Antenna, Broadband Antennas-Folded Dipole, Yagi-Uda Antenna, Log-Periodic Antenna.

UNIT-IV

Microwave Antennas: Horn Antenna & Types, Reflector Antennas- Corner Reflector, Parabolic Reflector – (Geometry, types of feeds, F/D Ratio, Spill Over, Back Lobes), Lens Antenna, Fundamentals of Rectangular Patch antenna. **Antenna Measurements:** Measurement of Antenna parameters- Directional pattern, Radiation resistance, Gain (Two Antenna, Three Antenna Methods), Directivity, Beam width, SLR, Polarization, Impedance.

UNIT-V

Wave Propagation: Concepts of Propagation-frequency ranges and types of propagation

Ground Wave Propagation: Characteristics, Parameters, Wave Tilt

Sky Wave Propagation: Formation of Ionosphere Layers and their Characteristics, Mechanism of Reflection and Refraction, Critical Frequency, MUF & Skip Distance, Optimum Frequency, LUHF, Virtual Height.

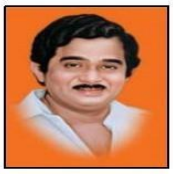
Space Wave Propagation: Fundamental Equation for free space Propagation, Basic Transmission Loss Calculations. Space Wave Propagation Mechanism, LOS and Radio Horizon, Duct Propagation.

TEXT BOOKS

1. Constantine A. Balanis, "Antenna Theory: Analysis and Design", John Wiley & sons Publishers, 2nd Edition.
2. G.S.N Raju, "Antennas and Wave Propagation", Pearson Education Publishers.

REFERENCE BOOKS

1. Jordan and Balmain, Electromagnetic fields and Radiating systems, Pearson Education Publishers.
2. John D. Kraus, "Antennas and Wave Propagation", TMH Publishers



Department of Electronics & Communication Engineering

III Year I Semester		L	T	P	C
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ELECTRONIC MEASUREMENTS AND INSTRUMENTATION (Professional Elective-I)					

Course Objectives:

Students should learn

1) Select the instrument to be used based on the requirements.
2) Understand and analyze the different types of transducers.
3) Understand the design of oscilloscopes for different applications.
4) Understand the principle of operation and working of various types of bridges for
5) measurement of parameters
6) Understand and analyze different signal generators and analyzers.

Course Outcomes:

Students will be able to

1) Evaluate basics of measurement systems, principle of basic meter
2) Design different transducers for measurement of different parameters.
3) Examining a signal / waveform with different oscillators.
4) Use bridges of many types and measure appropriate parameters.
5) Evaluate how a signal can be generated using different types of meters.

UNIT-I

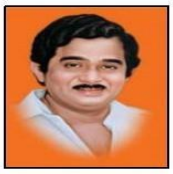
Qualities of Measurements: Introduction, Measurement standards, Performance characteristics of instruments, Static characteristics, Accuracy, Resolution, Precision, expected value, Error, Sensitivity. Errors in Measurement, Types of static errors-Gross errors, systematic errors, Instrumental errors, Observational errors, Random errors, Sources of error, Statistical analysis, Dynamic Characteristics-speed of response, Fidelity, Lag and Dynamic error. DC Voltmeters, AC voltmeters, True RMS Responding voltmeter, Electronic Millimeter.

UNIT-II

Transducers: Active & passive transducers: Resistance, Capacitance, inductance; Resistive Transducer, Unbounded resistance wire Strain gauge, bonded resistance wire strain gauge, Semiconductor strain gauge, Linear Variable Differential Transducer, Piezo electric transducers, Resistance Thermometers, Thermocouples, Thermostats.

UNIT-III

Oscilloscopes: CRT features, Block diagram of oscilloscope, vertical amplifier, horizontal deflection system, sweep, trigger pulse, delay line. Dual beam CRO, Dual trace oscilloscope, sampling oscilloscope, digital storage oscilloscope, Lissajous method of frequency measurement, standard specifications of CRO, CRO probes.



Department of Electronics & Communication Engineering

UNIT- IV

Bridges: Measurement of inductance - Maxwell's bridge, Anderson Bridge. Measurement of capacitance -Schearing Bridge. Wheatstone bridge. Wien Bridge, Errors and precautions in using bridges.

UNIT-V

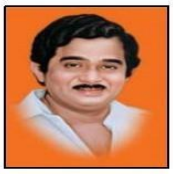
Signal Generator: Introduction, fixed frequency AF oscillator, variable frequency AF oscillator, Basic Standard signal generator, AF sine and square wave signal generators, Function Generators, Square pulse, Random noise, sweep, Arbitrary waveform. Introduction to Wave Analyzers, Harmonic Distortion Analyzers.

Text Books:

1) Electronic instrumentation, second edition - H.S.Kalsi, Tata McGraw Hill, 2004.
2) Modern Electronic Instrumentation and Measurement Techniques–A.D. Helfrick and, D.W. Cooper, PHI, 5th Edition, 2002.

Reference Books:

1) Electronic Instrumentation & Measurements -DavidA.Bell, PHI, 2ndEdition, 2003.
2) ElectronicTestInstruments,AnalogandDigitalMeasurements-RobertA.Witte,Pearson Education, 2nd Ed.,2004



Department of Electronics & Communication Engineering

III Year I Semester		L	T	P	C
		3	0	0	3
COMPUTER ARCHITECTURE & ORGGANIZATION (Professional Elective-I)					

COURSE OBJECTIVES:

1) To impart basic concepts of computer architecture and organization,
2) To explain key skills of constructing cost-effective computer systems.
3) To familiarize the basic CPU organization.
4) To help students in understanding various memory devices.
5) To facilitate students in learning IO communication

COURSE OUTCOMES:

1) At the end of the course students will be able to:
2) Identify various components of computer and their interconnection
3) Identify basic components and design of the CPU: the ALU and control unit.
4) Compare and select various Memory devices as per requirement.
5) Compare various types of IO mapping techniques
6) Critique the performance issues of cache memory and virtual memory

UNIT - I

STRUCTURE OF COMPUTERS: Computer types, Functional units, Basic operational concepts, Von Neumann Architecture, Bus Structures, Software, Performance, Multiprocessors and Multicomputer, Data representation, Fixed and Floating point, Error detection and correction codes. COMPUTER ARITHMETIC: Addition and Subtraction, Multiplication and Division algorithms, Floating-point Arithmetic Operations, Decimal arithmetic operations.

UNIT - II

BASIC COMPUTER ORGANIZATION AND DESIGN:

Instruction codes, Computer Registers, Computer Instructions and Instruction cycle. Timing and Control, Memory- Reference Instructions, Input-Output and interrupt. Central processing unit: Stack organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Complex Instruction Set Computer (CISC) Reduced Instruction Set Computer (RISC), CISC vs. RISC

UNIT - III

REGISTER TRANSFER AND MICRO-OPERATIONS: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro-Operations, Logic Micro- Operations, Shift Micro-Operations, Arithmetic logic shift unit.

MICRO-PROGRAMMED CONTROL: Control Memory, Address Sequencing, Micro- Program example, Design of Control Unit.

UNIT – IV

MEMORY SYSTEM: Memory Hierarchy, Semiconductor Memories, RAM(Random Access Memory), Read Only Memory (ROM), Types of ROM, Cache Memory, Performance considerations, Virtual memory, Paging, Secondary Storage, RAID.

UNIT – V

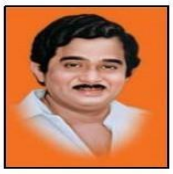
INPUT OUTPUT: I/O interface, Programmed IO, Memory Mapped IO, Interrupt Driven IO, DMA. MULTIPROCESSORS: Characteristics of multiprocessors, Interconnection structures, Inter Processor Arbitration, Inter processor Communication and Synchronization, Cache Coherence

TEXT BOOKS:

1) M. Moris Mano (2006), Computer System Architecture, 3rd edition, Pearson/PHI, India.

REFERENCE BOOKS:

1. 1.Carl Hamacher, Zvonks Vranesic, SafeaZaky (2002), Computer Organization, 5th edition, McGraw Hill, New Delhi, India. William Stallings (2010),
2. 2.Computer Organization and Architecture- designing for performance, 8th edition, Prentice Hall, New Jersy. Anrew S. Tanenbaum (2006),
3. Structured Computer Organization, 5th edition, Pearson Education Inc, 4. John P. Hayes (1998),
4. Computer Architecture and Organization, 3rd edition, Tata McGrawHill



Department of Electronics & Communication Engineering

III Year I Semester		L	T	P	C
		0	0	0	1.5
DIGITAL SYSTEM DESIGN LAB					

Course Educational Objectives:

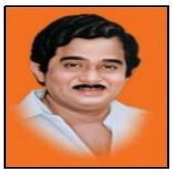
This lab provides practical exposure in Xilinx compiler and in-built simulator to describe the simulation of digital circuits using HDL and explain VHDL

Course Outcomes (COs):

1. At the end of the course, students will be able to
2. CO1: Understand the functionality of logic gates using HDL simulator. CO2: Analyze the digital circuits using HDL simulator.
3. CO3: Evaluate the functionality of memories using HDL simulator.

Programs to generate test bench simulation.

1. Implementation of Logic Gates – data flow model and behavioral model
2. Combinational logic circuits – adders and Subtractor
3. Code converters- binary to gray and gray to binary
4. 3 to 8 Decoder – 74138.
5. 4 Bit Comparator – 7485.
6. 8 x 1 Multiplexer – 74151 and 2X4 Demultiplexers – 74155
7. 16 x 1 Multiplexer – 74150 and 4X16 Demultiplexers – 74154
8. Sequential circuits - Flip-Flops
9. Decade counter – 7490.
10. Synchronous & Asynchronous Counters
11. Shift registers – 7495.
12. Universal shift registers – 74194/195.



Department of Electronics & Communication Engineering

III Year I Semester		L	T	P	C
		0	0	0	1.5
DIGITAL COMMUNICATION LAB					

Course Objectives:

Students should learn

1. The purpose of this course is to provide the student with a practical perspective of various digital communication modules.
2. Simplify the practical illustrations of variousDigital Modulation and demodulation techniques.
3. This lab focuses on the fundamental concepts of Sampling, Pulse modulations, Digital modulation techniques.
4. To be familiar with Spread spectrum modulation and demodulation techniques.

Course Outcomes:

Students will be able to

1. Design, implement and verifythe theoretical concepts of sampling practically.
2. Analyze and implement analog to digital converters like PCM, DM.
3. Comprehend the design, application and practical implementation of various Digital Modulation techniques.
4. Analyze digital modulation techniques using MATLAB tools.

List of Experiments

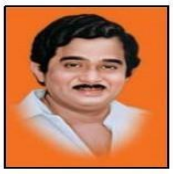
Hardware

1. Verification of Sampling Theorem
2. Pulse Code Modulation
3. Differential Pulse Code Modulation.
4. Delta Modulation.
5. Frequency Shift Keying
6. Phase Shift Keying

MATLAB Simulation

7. Verification of Sampling Theorem
8. Quantization of Signals
9. Pulse Code Modulation
10. Companding
11. Delta Modulation and Adaptive Delta Modulation
12. Digital modulation techniques
13. BPSK Data Transmission over AWGN Channel & BER Performance
14. Spread Spectrum Modulation & Demodulation
15. Generation of PN Sequences

MVR
College of Engineering & Technology
(An Autonomous Institution)
Sponsored by Swarna Academy of Sciences, Vijayawada
(Approved by AICTE, Affiliated to JNTUK, certified by ISO: 9001-2008, Accredited by NBA(CSE) and NAAC with 'A')



Department of Electronics & Communication Engineering

III Year – I Semester		L	T	P	C
		0	0	3	2
COMMUNICATION SKILLS &TRAINING SKILLS (SKILL ORIENTED COURSE)					

Course Objectives:

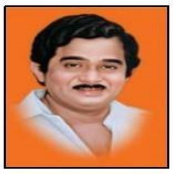
1. To encourage the all round development of students by focusing on soft skills.
2. To make the engineering students aware of the importance, the role and the content of soft skills through instruction, knowledge acquisition, demonstration and practice.
3. To develop and nurture the soft skills of the students through individual and group activities.
4. To expose students to right attitudinal and behavioral aspects and to build the same through activities

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

1. Effectively communicate through verbal/oral communication and improve the listening skills
2. Write precise briefs or reports and technical documents.
3. Actively participate in group discussion / meetings / interviews and prepare & deliver presentations.
4. Become more effective individual through goal/target setting, self motivation and practicing creative thinking.
5. Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality

List of Experiments

1. CREATIVITY
2. ADAPTABILITY
3. LEADERSHIP MANAGEMENT and Leadership skills.
4. INTERPERSONAL COMMUNICATION
5. PRESENTATION SKILLS
6. EMAIL AND VIRTUAL COMMUNICATION
7. CV WRITING
8. MOCK INTERVIEWS
9. WORK IN TEAMS
10. JOIN SPORTS TEAM OR CREATIVE ARTS CLUB.
11. VOLUNTEER SOMEWHERE YOU WILL TALK TO THE PUBLIC
12. PRACTICE MAKING PHONE OR VIDEO CALLS.
13. TIME MANAGEMENT SKILLS.
14. GROUP DISCUSSIONS.
15. DEBATES



Department of Electronics & Communication Engineering

III Year – II Semester		L	T	P	C
		3	0	0	3
MICROPROCESSORS AND MICROCONTROLLERS					

Course Educational Objective:

1. In this course student will learn about the architecture of 8086 Microprocessor, 8051 Microcontroller and ARM, programming using assembly language, interfacing of devices for real time applications.

Course Outcomes: (COs):

2. At the end of the course, students are able to:
3. Understand the architecture of 8086, 8051 and ARM Controller
4. Apply Assembly Language instructions for Processor and Controller based applications
5. Analyze the operating modes and interrupt structures of processors and controllers
6. Develop the ARM based interfacing systems for Real time applications

UNIT-I: 8086 MICROPROCESSOR

Architecture, Pin diagram, Register organization, Minimum mode and Maximum mode, timing diagrams. Addressing modes, Instruction set, Interrupt vector table, Assembly language programming - data transfer, arithmetic, logical and decision making operations.

UNIT- II: 8051 MICROCONTROLLER

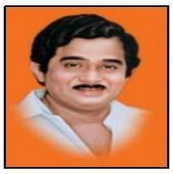
Architecture, Input/output Ports, Registers, Counter and Timers, Serial port, interrupts, addressing modes, instruction set and Programming - data transfer, arithmetic, logical and decision making operations.

UNIT – III: ARM ARCHITECTURE & PROGRAMMING MODEL

History, Architecture, ARM design philosophy, Registers, Program status register, Instruction pipeline, interrupts and vector table, ARM processor families, and Instruction set: Data processing instructions, Addressing modes, Branch, Load-Store instructions, PSR instructions, and Conditional instructions

UNIT – IV: ARM PROGRAMMING

Assembly programming, General structure of assembly language, Writing programs, Branch instructions, Loading constrains, load and store instructions, Read only and read/write Memory, Multiple Register Load and Store.



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UNIT – V: INTERFACING ARM WITH EXTERNAL PERIPHERALS

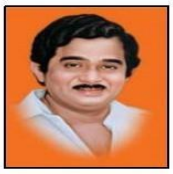
Interfacing - A/D and D/A converter, LEDs, Switches, Relays, LCD, Stepper Motors, Real Time Clock, Serial Communication, GSM and GPS

Text Books:

1. Ray and Burchandi, "Advanced Microprocessors and Interfacing", Tata McGraw–Hill.
2. M.A.Mazidi,S.Naimi and S.Naimi, "The AVR Microcontroller and Embedded Systems Using Assembly and C", 1st Edition Pearson Publications, 2013.

Reference Books:

1. N.Sentil Kumar, M.Saravanan, S.Jeevananthan, "Microprocessors and Microcontrollers", Oxford University Press, 2010.
2. Dhananjay V. Gadre, "Programming and Customizing the AVR Microcontroller", Tata McGraw-Hill publications, 2012.



Department of Electronics & Communication Engineering

III Year II Semester		L	T	P	C
		3	0	0	3
VLSI DESIGN					

Course Objectives: Students should learn

1. To introduce various fabrication steps of MOS transistors and their electrical
2. Properties.
3. To implement the stick diagrams and layouts using CMOS/Bi-CMOS design rules.
4. To explain MOS technology interconnection as circuits, scaling models, staticand dynamic designs.
5. To introduce the concepts of FPGA and testing methods of digital circuits.

Course Outcomes: The students will be able to

1. Analyze the Electrical properties and Fabrication processes of MOS circuits.
2. Design the layouts of various MOS circuits by applying the concept of designrules.
3. Interpret the basic MOS circuit concepts, the impact of scaling on MOS circuits
4. Static and dynamic CMOS logic designs and the impact of scaling on MOS circuits.
5. Analyze various testing methods of digital circuits and the basic concepts of FPGA.

UNIT-I

Introduction: Introduction to IC Technology, Fabrication process: NMOS, PMOS and CMOS. Ids versus Vds Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans conductance, Output Conductance and Figure of Merit. NMOS Inverter, Pull-up to Pull down Ratio for NMOS inverter driven by another NMOS Inverter, and through one or more pass transistors, Alternative forms of pull-up, The CMOS Inverter, Latch-up in CMOS circuits, Comparison between CMOS and Bi- CMOS technology.

UNIT-II

MOS and Bi-CMOS Circuit Design Processes: MOS Layers, Stick Diagrams, Design Rules and Layout, General observations on the Design rules, 2µm Double Metal, Double Poly, CMOS/BiCMOS rules, 1.2µm Double Metal, Double Poly CMOS rules, Layout Diagrams of NAND and NOR gates and CMOS inverter.

UNIT-III

Basic Circuit Concepts: Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, The Delay Unit, Inverter Delays, Propagation Delays, Wiring Capacitances, Choice of layers.

Scaling of MOS Circuits: Scaling models, Scaling factors for device parameters, Limitations of Scaling on substrate doping, Miniaturization, Interconnect and contact Resistance, Sub-threshold currents and current density.

UNIT- IV

CMOS Combinational and Sequential logic circuit design:

Static CMOS Design: Complementary CMOS and its static properties, Rationed logic, Pass Transistor logic-Design of logic gates. Dynamic CMOS Design: Basic principles, Issues in dynamic logic- charge leakage, charge sharing, Static latches and registers- Latches versus registers, the bi stability principle, SR-Flip flops, Multiplexer based latch, and Master-slave-edge triggered register.

UNIT-V

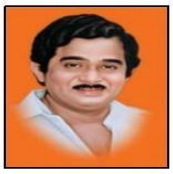
FPGA Design: FPGA design flow, Basic FPGA architecture, FPGA Technologies, Introduction to FPGA Families: Xilinx XC4000Test and Testability: Design for Testability-Path sensitization, Scan Design Techniques- Scan path, Level sensitive scan design (LSSD), Boundary scan test (BST) and Built-In- Self Test.

Text Books:

1. Essentials of VLSI Circuits and Systems by Kamran Eshraghian, Douglas and A.Pucknell and Sholeh Eshraghian, Prentice-Hall of India Private Limited, 2005 Edition.
2. Digital Integrated Circuits, Jan M. Rabaey, Anantha Chandrakasan and orivojeNikolic,2nd edition, 2016

Reference Books:

1. FPGA Based System Design‖- Wayne Wolf, Pearson Education, 2004, Technology and Engineering
2. CMOS Digital Integrated Circuits Analysis and Design, Sung-Mo Kang, YusufLeblebici, Tata McGraw Hill Education, 2003.



Department of Electronics & Communication Engineering

III Year II Semester		L	T	P	C
		3	0	0	3
DIGITAL SIGNAL PROCESSING					

Course Objectives:

This course introduces discrete time signals and systems and operations performed on them. Itintroduces Discrete time Fourier Transform, Discrete Fourier transform and Z transform meant for spectral analysis of discrete time signals and systems. Fast Fourier Transform that is an efficient way of implementing DFT is also introduced. It also provides the basic knowledge about the design of both IIR and FIR filters.

Course Outcomes:

After going through this course the student will be able to

1. Apply the difference equations concept in the analysis of Discrete time systems
2. Use the FFT algorithm for solving the DFT of a given signal
3. Design a Digital filter (FIR&IIR) from the given specifications
4. Realize the FIR and IIR structures from the designed digital filter.
5. Use the Multirate Processing concepts in various applications

UNIT I

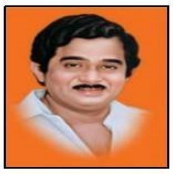
INTRODUCTION: Introduction to Digital Signal Processing: Discrete time signals & Sequences, Classification of Discrete time systems, stability of LTI systems, Invert ability, Response of LTI systems to arbitrary inputs. Solution of Linear constant coefficient difference equations, Frequency domain representation of discrete time signals and systems, Review of Z-transforms, solution of difference equations using Z-transforms, System Function

UNIT II

DISCRETE FOURIER SERIES &FOURIER TRANSFORMS: Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear filtering methods based on DFT, Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT.

UNIT III

DESIGN OF IIR DIGITAL FILTERS& REALIZATIONS: Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples, Analog and Digital frequency transformations. Basic structures of IIR systems, Transposed forms**.**



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UNIT IV

DESIGN OF FIR DIGITAL FILTERS & REALIZATIONS:

Characteristics of FIR Digital Filters, frequency response. Design of FIR Digital Filters using Window Techniques and Frequency Sampling technique, Comparison of IIR & FIR filters, Basic structures of FIR systems, Lattice structures, Lattice-ladder structures

UNIT V

INTRODUCTION TO DSP PROCESSORS: Introduction to programmable DSPs: Multiplier and Multiplier Accumulator, Modified bus structures and memory access schemes in P-DSPs ,Multiple Access Memory, Multi ported memory, VLIW architecture, Pipelining, Special addressing modes, On-Chip Peripherals.

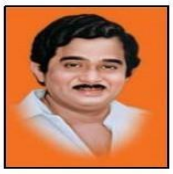
Architecture of TMS320C5X: Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Register ALU, Index Register, Block Move Address Register, Parallel Logic Unit, Memory mapped registers, program controller, some flags in the status registers, on- chip memory, On-chip peripherals

TEXT BOOKS:

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G.Manolakis, Pearson Education / PHI, 2007.
2. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, PHI

Reference Books:

1. Digital Signal Processing: Andreas Antoniou, TATA McGraw Hill , 2006
2. DSP Primer - C. Britton Rorabaugh, Tata McGraw Hill, 2005.
3. Digital Signal Processors – Architecture, Programming and Applications, B.Venkataramani, M.Bhaskar, TATA McGraw Hill, 2002



Department of Electronics & Communication Engineering

III Year II Semester		L	T	P	C
		3	0	0	3

MICROWAVE ENGINEERING
(Professional Elective-II)

COURSE OBJECTIVE: This course provides the knowledge on different types of waveguides and resonators. The course will give an idea about microwave communication in terms of various bands, advantages, applications. The course also gives the complete information regarding the microwave tubes and passive devices along with microwave bench setup and microwave measurements.

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

1. **Understand** the microwave sources, components and measurements of microwave parameters
2. **Develop** the TE, TM fields in waveguides and microwave signals using microwave tubes and solid state devices
3. **Apply** the properties of S-parameters to model the S-matrix of waveguide components
4. **Analyze** the flow of microwave fields in waveguides, components and efficiency of microwave tubes

UNIT-I

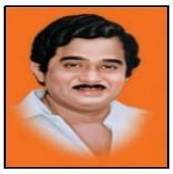
Introduction, Microwave Spectrum and Bands, Advantages and Applications of Microwaves. **Rectangular Waveguides**: Impossibility of TEM waves in waveguides, Transverse Magnetic and Transverse Electric Waves in Rectangular Waveguides, Field Expressions, characteristics of TE and TM Waves-Cutoff frequency, Dominant mode in Rectangular Waveguides, phase velocity, group velocity, relation between cutoff, guided and free space wavelengths, Wave impedances for TE and TM cases.

Circular Waveguides: TM and TE waves in circular guides, Field Expressions, Dominant mode in circular waveguide.

UNIT-II

Resonators: Rectangular and circular cavity resonators, Field Expressions, Re-entrant Cavities **Microwave Tubes:** Limitations of conventional tubes at microwave frequencies. Microwave tubes – O type and M type classifications.

Klystron Tubes: Two Cavity Klystrons – Structure, Velocity Modulation Process and Applegate Diagram, output Power and Efficiency. Reflex Klystrons – Structure, Applegate Diagram and Principle of working, Power Output, Efficiency, output Characteristics.



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UNIT-III

Helix TWT: Types and Characteristics of Slow Wave Structures; Structure of TWT and Amplification Process

M-Type Tubes: Cross-field effects, Magnetrons – Different Types, 8-Cavity Cylindrical Travelling Wave Magnetron: Hull Cut-off and Hartee Conditions, PI-Mode Operation, Strapping.

UNIT-IV

Microwave Solid State Devices: Negative resistance region, Classification, Applications. **Transferred Electron Devices:** Gunn Diode – Principle, Two Valley Model Theory, RWH Theory, Characteristics.

Avalanche Transit Time Devices: IMPATT and TRAPATT Diodes – Principle of Operation and Characteristics, related expressions.

UNIT-V

Waveguide Components: Scattering Matrix– Significance, Formulation and Properties. S Matrix Calculations for E plane and H plane Tees, Magic Tee, and Directional Coupler. Fundamentals of branch line, rat-race couplers, microwave filters. Ferrites– Composition and Characteristics, Faraday rotation; Ferrite Components – Gyrator, Isolator, Circulator. Microwave attenuators.

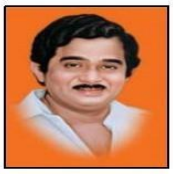
Microwave Measurements: Description of Microwave Bench setup, Precautions; Measurement of Attenuation, Frequency, VSWR, Impedance, and Power.

TEXT BOOKS

1. Samuel Y. Liao, "Microwave Devices and Circuits", PHI Publishers, 3rdEdition, 2003.
2. David M.Pozar, "Microwave Engineering", John Wiley Publishers, 4thEdition.

REFERENCE BOOKS

1. M Kulakarni, "Microwave and Radar Engineering", Umesh Publications, New Delhi 5thEdition
2. Jordan and Balmain, "Electromagnetic fields and Radiating systems", Pearson education.



Department of Electronics & Communication Engineering

III Year II Semester		L	T	P	C
		3	0	0	3
MOBILE AND CELLULAR COMMUNICATION (Professional Elective-II)					

Course Educational Objective: This course provides the knowledge on operation of cellular systems, techniques to improve the capacity of a cellular system, types of fading and its effects on the radio signal, methods to reduce channel interference, hand-off mechanisms, multiple access techniques and digital cellular systems.

Course Outcomes (COs):

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

1. Outline the concepts and operational principles of cellular systems
2. Summarize the multiple access techniques and evolution of cellular technologies.
3. Examine interferences, performance parameters, cell site & mobile antennas and methodologies to improve the cellular capacity.
4. Analyze the effects of radio propagation models, Frequency Management, Channel Assignment, handoff, and call drops in cellular communications

UNIT – I

Introduction to Cellular Systems: Basic cellular system, Operation of cellular systems, Call establishment, Operational channels, Performance criteria, concept of Digital cellular system. Hexagonal shaped cells, Frequency Reuse, Cell splitting, Sectoring, and Microcell zone concept.

UNIT – II

Mobile Radio Propagation: Basics of mobile radio propagation mechanisms, free space propagation, Link budget design, Propagation models, small-scale multipath propagation, factors influencing the fading, Types of small-scale fading. Cell Site Antennas and Mobile Antennas: Types - Omni directional antennas, directional antennas, sectoring, Mobile antenna types.

UNIT – III

Interference in cellular mobile system: Introduction to Co-Channel Interference, procedure to find nearest neighbors of a particular cell, Co-channel Interference Reduction Factor, Desired C/I from a normal and worst case in an omni-directional and directional Antenna system, impact on co-channel interference by lowering the antenna height, non co-channel interference.

UNIT – IV

Frequency Management and Channel Assignment: Numbering and grouping, setup channels, access channels and paging channels, channel assignments to cell sites and mobile units, overlaid cells, channel sharing and borrowing. Handoffs and Dropped Calls: Types of handoff, initiation, delaying handoff, forced handoff, mobile assigned handoff, Intersystem handoff, dropped call rate.

UNIT – V

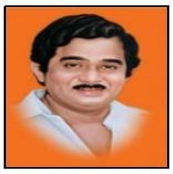
Digital Cellular Systems: multiple access schemes: FDMA, TDMA, CDMA. 2G Systems GSM system architecture. 3G Systems- architecture of WCDMA, 4G system- 4G network standards, LTE architecture, OFDMA, introduction to 5G technologies. Comparison of cellular technologies

TEXT BOOKS:

1. William C.Y. Lee,"Mobile Cellular Telecommunications", Tata McGraw Hill, 2nd Edition, 2006.
2. Gottapu Sasibhushana Rao, "Mobile Cellular Communication", Pearson Education,1 st Edition, 2013.

REFERENCES:

1. Theodore S. Rappaport, "Wireless Communications", Pearson Education, 2nd Edition, 2002. 2. R. Vannithamby and S. Talwar, Towards 5G: Applications, Requirements and Candidate Technologies., John Willey & Sons, West Sussex, 2017



Department of Electronics & Communication Engineering

III Year II Semester		L	T	P	C
		3	0	0	3
EMBEDDED SYSTEMS (Professional Elective-II)					

Course Objectives

1. The basic concepts of an embedded system are introduced.
2. The various elements of embedded hardware and their design principles are explained.
3. Different steps involved in the design and development of firmware for embedded systems is elaborated.
4. Internals of Real-Time operating system and the fundamentals of RTOS based embedded firmware design is discussed.
5. Fundamental issues in hardware software co-design were presented and explained.

Course Outcomes:

At the end of this course the student can able to:

1. Understand the basic concepts of an embedded system and able to know an embedded system design approach to perform a specific function.
2. The hardware components required for an embedded system and the design approach of an embedded hardware.
3. The various embedded firmware design approaches on embedded environment.
4. Understand how to integrate hardware and firmware of an embedded system using real time operating system.

UNIT-I

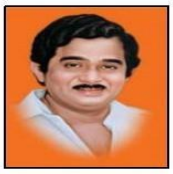
INTRODUCTION: Embedded system-Definition, history of embedded systems, classification of embedded systems, major application areas of embedded systems, purpose of embedded systems, the typical embedded system-core of the embedded system, Memory, Sensors and Actuators, Communication Interface, Embedded firmware, Characteristics of an embedded system, Quality attributes of embedded systems, Application-specific and Domain-Specific examples of an embedded system.

UNIT-II

EMBEDDED HARDWARE DESIGN: Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock.

UNIT-III

EMBEDDED FIRMWARE DESIGN: Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, interrupt servicing Mechanism, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.



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UNIT-IV

REAL TIME OPERATING SYSTEM: Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Threads, Processes and Scheduling, Task communication, Task synchronization.

HARDWARE SOFTWARE CO-DESIGN: Fundamental Issues in Hardware Software Co-Design, Computational models in embedded design, Hardware software Trade-offs, Integration of Hardware and Firmware.

UNIT-V:

EMBEDDED SYSTEM DEVELOPMENT, IMPLEMENTATION AND TESTING:

The integrated development environment, Types of files generated on cross-compilation, Dissembler/De-compiler, Simulators, Emulators and Debugging, Target hardware debugging, Embedded Software development process and tools, Interpreters, Compilers and Linkers, debugging tools, Quality assurance and testing of the design, testing on host machine, Simulators, Laboratory Tools.

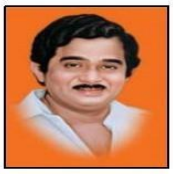
Case Study: digital camera hardware and software architecture, embedded systems in automobile, embedded system for a smart card, mobile phone software for key inputs.

Text Books:

1. Embedded Systems Architecture- By Tammy Noergaard, Elsevier Publications, 2013.
2. Embedded Systems-By Shibu

References:

1. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications, 2013.
2. Embedded Systems-Lyla B.Das-Pearson Publications,2013.



Department of Electronics & Communication Engineering

III Year II Semester		L	T	P	C
		3	0	0	3

CMOS ANALOG IC DESIGN
(Professional Elective-II)

Course Objectives:

1. To study the fundamentals of analog circuits and MOS device models
2. To gain knowledge on various configurations of MOS transistors and feedback concepts
3. To study the characteristics of noise and frequency response of the amplifier
4. To learn the concepts of Op-Amp frequency compensation, capacitor switches and PLLs

Course Outcomes:

Upon completion of the course, student should be able to:

1. Realize the concepts of Analog MOS devices and current mirror circuits.
2. Design different configuration of Amplifiers and feedback circuits.
3. Analyze the characteristics of frequency response of the amplifier and its noise.
4. Analyze the performance of the stability and frequency compensation techniques of Op- Amp Circuits.
5. Construct switched capacitor circuits and PLLs

UNIT I

INTRODUCTION TO ANALOG IC DESIGN AND CURRENT MIRRORS

Concepts of Analog Design - General consideration of MOS devices – MOS I/V Characteristics – Second order effects – MOS device models. Basic current mirrors- Cascode current mirrors- Active current mirrors- Large and Small signal analysis- Common mode properties.

UNIT II AMPLIFIERS AND FEEDBACK

Basic Concepts – Common source stage- Source follower- Common gate stage- Cascode stage. Single ended and differential operation- Basic Differential pair- Common mode response- Differential pair with MOS loads- Gilbert Cell. Feedback- General Consideration of feedback circuits- Feedback topologies- Effect of loading- Effect of feedback on Noise.

UNIT III FREQUENCY RESPONSE OF AMPLIFIERS AND NOISE

General considerations- Miller Effect and Association of Poles with Nodes, Common source stage- Source followers- Common gate stage- Cascode stage- Differential pair. Noise- Statistical characteristics of noise- Types of noise- Representation of noise in circuits- Noise in single stage amplifiers- Noise in differential pairs- Noise Bandwidth.

UNIT IV OPERATIONAL AMPLIFIER STABILITY AND FREQUENCY COMPENSATION

General Considerations- One and Two Stage Op Amps- Gain Boosting- Comparison- Common mode feedback- Input range limitations- Slew rate- Power Supply Rejection- Noise in Op Amps- General consideration of stability and frequency compensation- Multipole system- Phase margin- Frequency compensation- Compensation of two stage op Amps- Other compensation techniques.

UNIT V SWITCHED CAPACITOR CIRCUITS AND PLLS

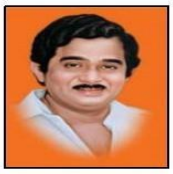
General Considerations- Sampling switches- Switched Capacitor Amplifiers- Switched Capacitor Integrator- Switched Capacitor Common mode feedback. Phase Locked Loops- Simple PLL- Charge pump PLLs - Non ideal Effects in PLLs- Delay locked loops- its Applications.

TEXT BOOK:

1. Behzad Razavi, ―Design of Analog CMOS Integrated Circuits‖, Tata McGraw Hill, 2001, 33rd re-print, 2016.

REFERENCES:

1. Phillip Allen and Douglas Holmberg ―CMOS Analog Circuit Design‖ Second Edition, Oxford University Press, 2004.
2. Paul R. Gray, Paul J. Hurst, Stephen H. Lewis, Robert G. Meyer, Analysis and Design of Analog Integrated Circuits, 5th Edition, Wiley, 2009
3. Grebene, ―Bipolar and MOS Analog Integrated circuit design‖, John Wiley & sons, Inc., 2003



Department of Electronics & Communication Engineering

III Year II Semester		L	T	P	C
		3	0	0	3
COMPUTER NETWORKS					

Course Objectives:

1. To provide insight about networks, topologies, and the key concepts.
2. To gain comprehensive knowledge about the layered communication architectures (OSI and TCP/IP) and its functionalities.
3. To understand the principles, key protocols, design issues, and significance of each layers in ISO and TCP/IP.
4. To know the basic concepts of network services and various network applications.

Course Outcomes:

1. By the end of the course, the student will be able to
2. Demonstrate different network models for networking links OSI, TCP/IP, B- ISDN, and N-BISDN and get Knowledge about various communication techniques, methods and protocol standards.
3. Discuss different transmission media and different switching networks.
4. Analyze data link layer services, functions and protocols like HDLC and PPP.
5. Compare and Classify medium access control protocols like ALOHA, CSMA, CSMA/CD, CSMA/CA, Polling, Token passing, FDMA, TDMA, CDMA protocols
6. Determine application layer services and client server protocols working with the client server paradigms like WWW, HTTP, FTP, e-mail and SNMP etc.

UNIT I:

Introduction: Network Types, LAN, MAN, WAN, Network Topologies Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models, OSI Vs TCP/IP, Lack of OSI models success, Internet History. Physical Layer –Introduction to Guided Media- Twisted-pair cable, Coaxial cable and Fiber optic cable and unguided media: Wireless-Radio waves, microwaves, infrared.

UNIT II:

Data link layer: Design issues, Framing: fixed size framing, variable size framing, flow control, error control, error detection and correction codes, CRC, Checksum: idea, one's complement internet checksum, services provided to Network Layer, Elementary Data Link Layer protocols: simplex protocol, Simplex stop and wait, Simplex protocol for Noisy Channel. Sliding window protocol: One bit, Go back N, Selective repeat-Stop and wait protocol, Data link layer in HDLC: configuration and transfer modes, frames, control field, point to point protocol (PPP): framing transition phase, multiplexing, multi link PPP.

UNIT – III:

Media Access Control: Random Access: ALOHA, Carrier sense multiple access (CSMA), CSMA with Collision Detection, CSMA with Collision Avoidance, Controlled Access: Reservation, Polling, Token Passing, Channelization: frequency division multiple Access (FDMA), time division multiple access (TDMA), code division multiple access (CDMA). Wired LANs: Ethernet, Ethernet Protocol, Standard Ethernet, Fast Ethernet (100 Mbps), Gigabit Ethernet, 10 Gigabit Ethernet.

UNIT – IV:

The Network Layer Design Issues – Store and Forward Packet Switching-Services Provided to the Transport layer- Implementation of Connectionless Service-Implementation of Connection Oriented Service- Comparison of Virtual Circuit and Datagram Networks, Routing Algorithms-The Optimality principle-Shortest path, Flooding, Distance vector, Link state, Hierarchical, Congestion Control algorithms-General principles of congestion control, Congestion prevention polices, Approaches to Congestion Control-Traffic Aware Routing- Admission Control-Traffic Throttling-Load Shedding. Traffic Control Algorithm-Leaky bucket & Token bucket. Internet Working: How networks differ-How networks can be connected- Tunneling, internetwork routing-, Fragmentation, network layer in the internet – IP protocols-IP Version 4 protocol-IPV4 Header Format, IP addresses, Class full Addressing, CIDR, NAT-, Subnets-IP Version 6-The main IPV6 header, Transition from IPV4 to IPV6, Comparison of IPV4 & IPV6- Internet control protocols- ICMP-ARP- DHCP

UNIT –V:

The Transport Layer: Transport layer protocols: Introduction-services- port number-User data gram protocol-User datagram-UDP services-UDP applications-Transmission control protocol: TCP services-TCP features- Segment- A TCP connection- windows in TCP- flow control-Error control, Congestion control in TCP. Application Layer –- World Wide Web: HTTP, Electronic mail-Architecture- web based mail- email security- TELENET-local versus remote Logging-Domain Name System: Name Space, DNS in Internet ,-Resolution-Caching- Resource Records- DNS messages- Registrars-security of DNS Name Servers, SNMP.

Text Books:

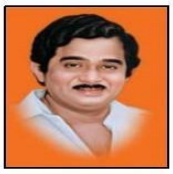
1. Computer Networks — Andrew S Tanenbaum, Fifth Edition. Pearson Education/PHI

2. Data Communications and Networks – Behrouz A. Forouzan, Fifth Edition TMH.

References Books:

1. Data Communications and Networks- Achut S Godbole, Atul Kahate

2. Computer Networks, Mayank Dave, CENGAGE



Department of Electronics & Communication Engineering

III Year –II SEMESTER		L	T	P	C
		3	0	0	3
FUNDAMENTALS OF UTILIZATION OF ELECTRICAL ENERGY (OPEN ELECTIVE – II)					

Course Objectives:

1. To study the various types of Illumination equipment, measurement ofIllumination, Illumination techniques.
2. To know the various technologies used for heating applications using electrical energy.
3. To understand the various welding techniques and operations of weldingequipment and comparison.
4. To know the various systems of traction, equipment used for traction.
5. To understand the importance and operation of various Energy storagesystems and comparison& applications.

Course Outcomes:

After the completion of the course the student should be able to:

1. Know the concepts of illumination and various illumination methods.
2. Know about the resistance - induction and dielectric heating.
3. Learn about the resistance and arc welding and welding equipment
4. Know about the mechanisms - equipment and technology used in the electric traction.
5. Differentiate the importance of various energy storage systems

UNIT - I

Illumination fundamentals Introduction - terms used in illumination–Laws of illumination–Lux meter–Sources of light. Various Illumination Methods Tungsten filament lamps and fluorescent lamps - Comparison –Basic principles of light control– Types and design of lighting and flood lighting–LED lighting - Energy conservation.

UNIT - II

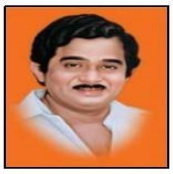
Electric Heating Advantages and methods of electric heating–Resistance heating induction heating and dielectric heating.

UNIT - III

Electric Welding Electric welding–Resistance and arc welding–Electric welding equipment–Comparison between AC and DC Welding

UNIT - IV

Electric Traction System of electric traction and track electrification– Review of existing electric traction systems in India– Special features of traction motor– Mechanics of train movement–Speed–time curves for different services – Trapezoidal and quadrilateral speed time curves. Calculations of attractive effort– power – Specific energy consumption for given run–Effect of varying acceleration and braking retardation– Adhesive weight and braking retardation adhesive weight and coefficient of adhesion.



Department of Electronics & Communication Engineering

UNIT - V

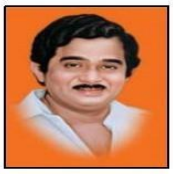
Introduction to Energy Storage Systems Need for energy storage - Types of energy storage-Thermal - electrical - magnetic and chemical storage systems - Comparison of energy storage technologies-Applications.

Text Books:

1. Electrical Power Systems (Generation, Transmission, Distribution, Protecection and Utilization ofElectrical Energy) – Dr. S.L.Uppal and Prof. Sunil S.Rao – Khanna Publisher, 15th edition, 1987.
2. Electric Power Distribution – A S Pabla – McGrawHill.

Reference Books:

1) Generation Distribution and Utilization of Electrical Energy – C.L.Wadhwa- New Age International Publishers- revised third edition.



Department of Electronics & Communication Engineering

III Year –II SEMESTER		L	T	P	C
		3	0	0	3
INDIAN ELECTRICITY ACT (OPEN ELECTIVE – II)					

Course Objectives:

1. To acquire knowledge on national policy, plan and joint responsibilities of state and central governments.
2. To understand the licensing procedures in transmission and distribution companies.
3. To learn the regulatory body rules and protocols.
4. To understand the offences and penalties related issues with respect to different tribunals.
5. To learn the legal related issues and their resolutions.

Course Outcomes:

After the completion of the course the student should be able to:

1. Learn the national policy and plan and the joint responsibilities of state and central governments.
2. Analyze the licensing and the provisions related to transmission and distribution of electricity.
3. Remember the composition and powers of Regulatory commissions and CEA.
4. Learn the functions of Appellate Tribunal for electricity.
5. Know the constitution procedure and provisions in Special courts and dispute resolutions.

UNIT – I

National Electricity Policy and Plan - Generation of Electricity

Electricity Act: commencement - definitions - comments; national policy on standalone systems - non- conventional energy systems - electrification and local distribution for rural areas; joint responsibilities of state and central governments in rural electrification - requirement for setting up of generating station - hydro-electric generation - captive generation; duties of generating companies.

UNIT – II

Licensing -Transmission and Distribution of Electricity

Licensing: powers - procedures - conditions - amendments - revocation - provisions - directions - suspension and sale; inter-state and intra-state transmission; other provisions relating to transmission; provisions with respect to distribution licenses - electricity traders - supply generally; consumer protection: standard performance.

Electrical Wiring, Estimation & Costing

UNIT – III

Tariff - CEA and Regulatory Commissions

Works of licenses - provisions relating to overhead lines; Constitution and functions of Central Electricity Authority (CEA) - directions and certain powers; Constitution - powers and functions of state and central commissions - other provisions - proceedings and powers of appropriate commission - Grants - Fund - Accounts Audit and Report

UNIT – IV

Appellate Tribunal - Reorganization of Boards - Offences and Penalty

Appellate Tribunal for electricity; investigation and assessment; reorganization of boards; Offences and penalties.

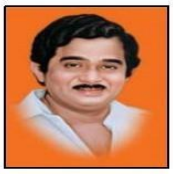
UNIT – V

Special Courts - Dispute Resolution - Other Provisions and Miscellaneous

Constitution of special courts - procedures - powers - appeal - revision; arbitration; protective clauses; miscellaneous and enactments.

Text Books:

1. The Electricity Act - 2003 {Act 36 of 2003 - dt.2-6-2003 - w.e.f. 10-6-2003 vide S.O. No.669(E) - dt. 10-6-2003] published by Commercial Law Publishers (I) Pvt. Ltd.



Department of Electronics & Communication Engineering

III Year – II Semester		L	T	P	C
		0	0	3	1.5

MICROPROCESSORS AND MICROCONTROLLERS LAB

Course Educational Objective:

In this course student will learn about the architecture of 8086 Microprocessor, 8051 Microcontroller and ARM, programming using assembler language, interfacing of devices for real time applications

Course Outcomes: (COs): At the end of the course, students are able to:

1. Demonstrate the MASM/TASM tool for developing Assembly Language Programs.
2. Apply the Assembly Language instructions of Processor and Controller for logical operations.
3. Develop the ARM based interfacing systems for Real time applications. CO 4 Adapt effective communication, presentation and report writing skills.

List of Experiments:

Part – 1:

Programming using MASM:

4. Display, comparison and reverse the string.
5. Factorial using Procedures.
6. Sorting the signed and unsigned numbers.
7. Checking the given string for Palindrome.

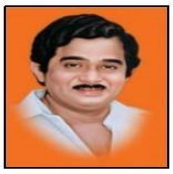
Programming using 8051:

1. Arithmetic operations like Addition, Subtraction, Multiplication and Division.
2. Byte checking by using 8051
3. Addition of series of numbers
4. Checking the given numbers for Odd or Even

Part – II: Interfacing using ARM:

1. Interfacing of A/D and D/A converter
2. Interfacing of LEDs and Switches
3. Interfacing of LCD
4. Interfacing of Stepper Motors
5. Interfacing of traffic Light controller
6. Interfacing of Real Time Clock
7. Data loggers – Rollover display

Note: Minimum of 6 experiments from each part to be conducted.



Department of Electronics & Communication Engineering

III Year II Semester		L	T	P	C
		0	0	0	1.5
VLSI DESIGN LAB					

Course Educational Objective: The course explores the design and implementation aspects of various combinational and sequential circuits used in VLSI Design. It also develops the knowledge in VLSI Front End and Back End Design in semi-custom and full-custom design.

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

1. Implement combinational and sequential circuits on FPGA/CPLD boards.
2. Design the Combinational and Sequential logic using NMOS and CMOS Technology.
3. Analyze combinational and sequential circuits using Static CMOS logic from schematic to layout.
4. Adapt effective communication, presentation and report writing skills.

LIST OF EXPERIMENTSPART-1:

VLSI FRONT END DESIGN USING XILINX TOOL:

1. Implementation of Carry-Look-Ahead adder.
2. Implementation of 4x4 Array Multiplier.
3. Implementation of a 4-bit ALU.
4. Implementation of Zero /One Detector.
5. Implementation of flip flops: SR, D, JK, T.

PART-2:

VLSI BACK END DESIGN USING CADENCE/MENTOR GRAPHICS TOOLS:

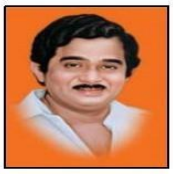
PART-2.1: Full Custom Design:

1. Design and analysis of NMOS Inverter.
2. Design and analysis of CMOS Inverter
3. Design and analysis of CMOS NOR gate.
4. Design and analysis of CMOS NAND gate.
5. Design and analysis of CMOS D- Flip Flop

PART-2.2: Semi Custom Design

1. Design and analysis of Full Adder
2. Design and analysis of Decoder
3. Design and analysis of 8- bit Binary Counter
4. Design and analysis of Shift Register
5. Design and analysis of Sequence Detector

Note: Minimum of 3 experiments from part-1 and 7 experiments from part-2 are to be conducted



Department of Electronics & Communication Engineering

III Year II Semester		L	T	P	C
		0	0	0	1.5
DIGITAL SIGNAL PROCESSING LAB					

Course Objectives: This course provides generation of basic signals and operations on signals. This course also provides design of IIR filters using Butterworth and Chebyshev approximation techniques and FIR filters using windowing techniques. This course also gives the knowledge about DSP Processors.

Course Outcomes (COs): At the end of the course, students are able to

1. **Understand** the generation and operations of signals using MATLAB.
2. **Analyze** the signals in time and frequency domains using MATLAB and CodeComposer Studio
3. **Design** IIR and FIR Filters and obtain their frequency response using MATLAB.
4. **Adapt** effective communication, presentation skills and report writing.

List of Experiments

Part I: Experiments using MATLAB Software

1. Generation of discrete time (DT) signals and operations on DT signals.
2. Linear Convolution.
3. Circular Convolution.
4. Computation of N-Point DFT and IDFT.
5. Linear and Circular convolution using DFT and IDFT.
6. Power Spectral Density for sinusoidal signal.
7. Design of Digital IIR butter worth filter using Bi-linear Transformation.
8. Design of Digital IIR Chebyshev filters using Bi-linear Transformation.
9. Design of FIR filters using window techniques.

Part II: Experiments using Code Composer Studio Simulation Soft ware and DSP Processors.

1. Linear Convolution.
2. Circular Convolution.
3. Computation of DFT.

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(Approved by AICTE, Affiliated to JNTUK, certified by ISO: 9001-2008, Accredited by NBA(CSE) and NAAC with 'A')

IV Year I Semester		L	T	P	C
		3	0	0	3
OPTICAL COMMUNICATION (PROFESSIONAL ELECTIVE-3)					

Course Educational Objective: This course gives knowledge on optical communication fundamentals, fiber types and materials. This course also describes about transmission losses in the fiber, optical sources, source to fiber coupling scheme, and optical receivers. This course also provides understanding of digital optical link, analog optical systems, and wavelength division multiplexing and optical networks.

Course Outcomes:

After going through this course the student will be able to

1) Choose necessary components required in modern optical communications systems.
2) Design and build optical fiber experiments in the laboratory, and learn how to calculate electromagnetic modes in waveguides, the amount of light lost going through an optical system, dispersion of optical fibers.
3) Use different types of photo detectors and optical test equipment to analyze optical Fiber and light wave systems.
4) Choose the optical cables for better communication with minimum losses
5) Design, build, and demonstrate optical fiber experiments

UNIT I

Overview of optical fiber communication - Historical development, the general system, advantages of optical fiber communications. Optical fiber wave guides- Introduction, Ray theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Skew rays, Cylindrical fibers- Modes, V-number, Mode coupling, Step Index fibers, Graded Index fibers, Single mode fibers- Cut off wavelength, Mode Field Diameter, Effective Refractive Index, Related problems.

UNIT II

Fiber materials:- Glass, Halide, Active glass, Chalganide glass, Plastic optical fibers. Signal Distortion in optical fibers-Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses, Information capacity determination, Group delay, Types of Dispersion:- Material dispersion,Wave-guidedispersion,Polarization-Modedispersion,Intermodal Dispersion, Pulse broadening in Graded index fiber, Related problems.

UNIT III

Optical fiber Connectors-Connector types, Single mode fiber connectors, Connector return loss, Fiber Splicing- Splicing techniques, Splicing single mode fibers, Fiber alignment and joint loss- Multimode fiber joints, single mode fiber joints.

UNIT IV

Optical sources- LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product. Injection Laser Diodes- Modes, Threshold conditions, External Quantum efficiency, Laser diode rate equations, resonant frequencies, Reliability of LED&ILD, Optical detectors- Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparison of Photo detectors, related problems.

UNIT V

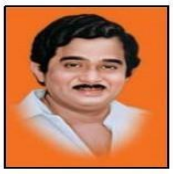
Source to fiber power launching - Output patterns, Power coupling, Power launching, Equilibrium Numerical Aperture, Laser diode to fiber coupling, Optical receiver operation- Fundamental receiver operation, Digital signal transmission, error sources, Receiver Configuration, Digital receiver performance, Probability of Error, Quantum limit, Analog Optical system design - Point-to- point links- Component choice and considerations, Link Power budget, Rise time budget with examples, Line coding in Optical links, WDM, Necessity, Principles, Measurement of Attenuation and Dispersion, Eye pattern.

TEXT BOOKS:

1) Optical Fiber Communications – Gerd Keiser, Mc Graw-Hill International edition, 3rd Edition, 2000.
2) Optical Fiber Communications – John M. Senior, PHI, 2nd Edition, 2002.

RERFERENCES:

1. Fiber Optic Communications – D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner,Pearson Education, 2005.
1. Fiber Optic Communications – Joseph C. Palais, 4th Edition, Pearson Education,2004.



Department of Electronics & Communication Engineering

IV Year I Semester		L	T	P	C
		3	0	0	3
DIGITAL IMAGE PROCESSING (PROFESSIONAL ELECTIVE-3)					

Course Objectives

1. The fundamentals of Computer Graphics and Image Processing
2. The concepts related edge detection, segmentation, morphology and image compression methods.

Course Outcomes:

1. After undergoing the course students will be able to
2. Perform image manipulations and different digital image processing techniques
3. Perform basic operations like – Enhancement, segmentation, compression, Image transforms and restoration techniques on image.
4. Analyze pseudo and full color image processing techniques.
5. Apply various morphological operators on images

UNIT I

Introduction to Image Processing, Fundamental steps in digital image processing, components of an image processing system, image sensing and acquisition, image Sampling and quantization, some basic relationships between pixels, an introduction to the mathematical tools used in digital image processing. Image Transforms: Need for image transforms, Discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, some properties of the 2-D Discrete Fourier transform, Importance of Phase, Walsh Transform. Hadamard transform, Haar Transform, Slant transform, Discrete Cosine transform, KL Transform, SVD and Radon Transform, Comparison of different image transforms

UNIT II

Intensity Transformations and Spatial Filtering: Background, Some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters, sharpening spatial filters, combining spatial enhancement methods

Filtering in the Frequency Domain: Preliminary concepts, The Basics of filtering in the frequency domain, image smoothing using frequency domain filters, Image Sharpening using Frequency domain filters, Selective filtering

UNIT III

Image Restoration and Reconstruction: A model of the image degradation / Restoration process, Noise models, restoration in the presence of noise only-Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear, Position –Invariant Degradations, Estimating the degradation function, Inverse filtering, Minimum mean square error (Wiener) filtering, constrained least squares filtering ,geometric mean filter ,image reconstruction from projections.

UNIT IV

Image compression: Fundamentals, Basic compression methods: Huffman coding, Golomb coding, Arithmetic coding, LZW coding, Run-Length coding, Symbol-Based coding, Bit- Plane coding,

Block Transform coding, Predictive coding

Wavelets and Multi resolution Processing: Image pyramids, sub band coding, Multi resolution expansions, wavelet transforms in one dimensions & two dimensions, Wavelet coding.

UNIT V

Image segmentation: Fundamentals, point, line, edge detection, thresholding, and region –based Segmentation.

Morphological Image Processing: Preliminaries, Erosion and dilation, opening and closing, basic morphological algorithms for boundary extraction, thinning, gray-scale morphology, segmentation using morphological watersheds.

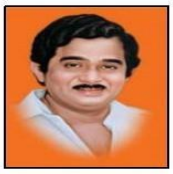
Color image processing: color fundamentals, color models, pseudo color image processing, Basics of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression.

Text Books

1) R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.
2) Jayaraman, S. Esakkirajan, and T. Veerakumar," Digital Image Processing", Tata McGraw-Hill Education, 2011.

Reference Books

1) Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 9th Edition, Indian Reprint, 2002.
2) B.Chanda, D.Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2009.



Department of Electronics & Communication Engineering

IV Year I Semester		L	T	P	C
		3	0	0	3
LOW POWER VLSI DESIGN (PROFESSIONAL ELECTIVE-3)					

Course Objectives

1) The student will be able to understand the Fundamentals of Low Power VLSI Design.
2) In this course, students can study low-Power Design Approaches, Power estimation and analysis.
3) Another main object of this course is to motivate the graduate students to study and to analyze the Low-Voltage Low-Power Adders, Multipliers.
4) The concepts of Low-Voltage Low-Power Memories and Future Trend and Development of DRAM.

Course Outcomes:

1) Capability to recognize advanced issues in VLSI systems, specific to the deep-submicron silicon Technologies.
2) Students able to understand deep submicron CMOS technology and digital CMOS design styles.
3) To design chips used for battery-powered systems and high performance circuits.
4) Learn the design of various CMOS dynamic logic circuits.
5) Learn the design techniques low voltage and low power CMOS circuits for various applications.
6) Learn the different types of memory circuits and their design.

UNIT-I:

Sources of Power Dissipation Introduction, Short-Circuit Power Dissipation, Switching Power Dissipation, Dynamic Power for a Complex Gate, Reduced Voltage Swing, Switching Activity, Leakage Power Dissipation, p–n Junction Reverse-Biased Current, Band-to-Band Tunneling Current, Sub threshold Leakage Current, Short-Channel Effects

UNIT 2:

Supply Voltage Scaling for Low Power Device Feature Size Scaling, Constant-Field Scaling, Constant-Voltage Scaling, Architectural- Level Approaches: Parallelism for Low Power, Pipelining for Low Power, Combining Parallelism with Pipelining, Voltage Scaling Using High-Level Transformations: Multilevel Voltage Scaling Challenges in MVS Voltage Scaling Interfaces, Static Timing Analysis Dynamic Voltage and Frequency Scaling

UNIT-3:

Switched Capacitance Minimization Probabilistic Power Analysis: Random logic signals, probability and frequency, probabilistic power analysis techniques, signal entropy, Bus Encoding: Gray Coding, One-Hot Coding, Bus- Inversion, T0 Coding, Clock Gating, Gated-Clock FSMs FSM State Encoding, FSM Partitioning, Precomputation, Glitching Power Minimization

UNIT 4:

Leakage Power Minimization Fabrication of Multiple Threshold Voltages, Multiple Channel

Doping, Multiple Oxide CMOS, Multiple Channel Length, Multiple Body Bias, VTCMOS Approach, MTCMOS Approach, Power Gating, Clock Gating Versus Power Gating, Power-Gating Issues, Isolation Strategy, State Retention Strategy, Power-Gating Controller, Power Management, Combining DVFS and Power Management

UNIT 5:

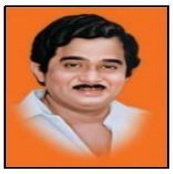
Low power clock distribution& Simulation Power Analysis Low power clock distribution: Power dissipation in clock distribution, single driver versus distributed buffers, Zero skew versus tolerable skew, chip and package co design for clock network. Simulation Power Analysis: SPICE circuit simulators, gate level logic simulation, capacitive power estimation, architecture level analysis, data correlation analysis of DSP systems, Monte Carlo Simulation Special Techniques: Power Reduction in Clock networks, CMOS Floating Node, Low Power Bus Delay balancing, and Low Power Techniques for SRAM.

TEXT BOOKS:

1) Low-Power VLSI Circuits and Systems, Ajit Pal, SPRINGER PUBLISHERS
2) PRACTICAL LOW POWER DIGITAL VLSI DESIGN, Gary Yeap Motorola, SPRINGER SCIENCE+BUSINESS MEDIA, LLC.

REFERENCE BOOKS:

1) Low Power CMOS Design – Anantha Chandrakasan, IEEE Press/Wiley International, 1998.
2) Massoud Pedram, Jan M. Rabaey, "Low power design methodologies ", Kluwer Academic Publishers.
3) Low Power CMOS VLSI Circuit Design – A. Bellamour, M. I. Elamasri, Kluwer Academic Press, 1995. R-20 Syllabus for ECE - JNTUK w. e. f. 2020 – 21



Department of Electronics & Communication Engineering

IV Year I Semester		L	T	P	C
		3	0	0	3
RADAR ENGINEERING (PROFESSIONAL ELECTIVE-4)					

Course Outcomes:

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

1. Derive the radar range equation and to solve some analytical problems.
2. Understand the different types of radars and its applications.
3. Understand the concept of tracking and different tracking techniques.
4. Understand the various components of radar receiver and its performance.

UNIT–I:

Basics of Radar: Introduction, Maximum Unambiguous Range, simple Radar range Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Illustrative Problems

Radar Equation : Modified Radar Range Equation, SNR, probability of detection, probability of False Alarm, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Creeping Wave, Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Illustrative Problems.

UNIT–II:

CW and Frequency Modulated Radar : Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar. Illustrative Problems

FM-CW Radar: Range and Doppler Measurement, Block Diagram and Characteristics, FM-CW altimeter, Multiple Frequency CW Radar.

UNIT-III:

MTI and Pulse Doppler radar: Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, Nth Cancellation Staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance, MTIversus Pulse Doppler radar.

UNIT –IV:

Tracking Radar: Tracking with Radar, Sequential Lobing, Conical Scan, Mono pulse Tracking Radar – Amplitude Comparison Mono pulse (one- and two- coordinates), Phase

Comparison Mono pulse, tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

UNIT –V:

Detection of Radar Signals in Noise : Introduction, Matched Filter Receiver – Response Characteristics and Derivation, Correlation detection and Cross-correlation Receiver, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise, Noise Figure and Noise Temperature.

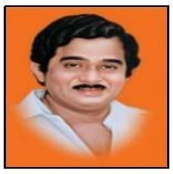
Radar Transmitters & Receivers –Displays – types. Duplexers – Branch type and Balanced type, Circulators as Duplexers. Introduction to Phased Array Antennas – Basic Concepts, Radiation Pattern, Beam Steering and Beam Width changes, Series versus parallel feeds, Applications, Advantages and Limitations. Radom's Modulators, solid state

TEXT BOOKS:

1. Introduction to Radar Systems – Merrill I. Skolnik, TMH Special Indian Edition, 2ndEd. 2007.

REFERENCE BOOKS:

1) Radar: Principles, Technology, Applications – Byron Edde, Pearson Education, 2004.
2) Radar Principles – Peebles, Jr., P.Z., Wiley, New York, 1998.
3) Principles of Modern Radar: Basic Principles – Mark A. Richards, James A. Scheer, William A. Holm, Yesdee, 2013
4) Radar Engineering – GSN Raju, IK International.



Department of Electronics & Communication Engineering

IV Year – I Semester		L	T	P	C
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PATTERN RECOGNITION & MACHINE LEARNING (PROFESSIONAL ELECTIVE-4)					

Course Outcomes:

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

1. Studythe parametric and linear models for classification
2. Design neural network and SVM for classification
3. Develop machine independent and unsupervised learning techniques.

Unit I

Introduction to Pattern Recognition: Problems, applications, design cycle, learning and adaptation, examples, Probability Distributions, Parametric Learning - Maximum likelihood and Bayesian Decision Theory- Bays rule, discriminate functions, loss functions and Bayesian error analysis

Unit II

Linear models: Linear Models for Regression, linear regression, logistic regression Linear Models for Classification

Unit III

Neural Network: perception, multi-layer perception, back propagation algorithm, error surfaces, practical techniques for improving back propagation, additional networks and training methods, Ad boost, Deep Learning

Unit IV

Linear discriminate functions - decision surfaces, two-category, multi-category, minimum- squared error procedures, the Ho-Kashyap procedures, linear programming algorithms, Support vector machine

Unit V

Algorithm independent machine learning – lack of inherent superiority of any classifier, biasand variance, re-sampling for classifier design, combining classifiers

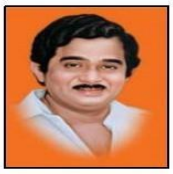
Unsupervised learning and clustering – k-means clustering, fuzzy k-means clustering, hierarchical clustering

TEXT BOOKS:

1. Richard O. Duda, Peter E. Hart, David G. Stork, "Pattern Classification", 2ndEdition JohnWiley & Sons, 2001.
2. Machine learning by Saikat Dutt, S. Chandramouli and A.K.Das Pearso publishing,2018.

REFERENCE BOOKS:

1. C. Bishop, "Pattern Recognition and Machine Learning", Springer,2006
2. Trevor Hastie, Robert Tibshirani, Jerome H. Friedman, "The Elements of StatisticalLearning", 2nd Edition, Springer, 2009.



Department of Electronics & Communication Engineering

IV Year I Semester		L	T	P	C
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INTERNET OF THINGS (PROFESSIONAL ELECTIVE-5)					

Course Outcomes:

The student will be able to:

1. Understand internet of Things and its hardware and software components.
2. Interface I/O devices, sensors & communication modules.
3. Remotely monitor data and control devices.
4. Design real time IoT based applications

UNIT I:

Introduction to IoT Introduction to IoT, Architectural Overview, Design principles and needed capabilities, Basics of Networking, M2M and IoT Technology Fundamentals-Devices and gateways, Data management, Business processes in IoT, Everything as a Service (XaaS), Role of Cloud in IoT, Security aspects in IoT.

UNIT II: Elements of IoT Hardware Components- Computing- Arduino, Raspberry Pi, ARM Cortex-A class processor, Embedded Devices – ARM Cortex-M class processor, Arm Cortex-M0 Processor Architecture, Block Diagram, Cortex-M0 Processor Instruction Set, ARM and Thumb Instruction Set.

UNIT III:

IoT Application Development Communication, IoT Applications, Sensing, Actuation, I/O interfaces. Software Components- Programming API‟s (using Python/Node.js/Arduino) for Communication Protocols-MQTT, **ZigBee**, CoAP, UDP, TCP, Bluetooth. Bluetooth Smart Connectivity Bluetooth overview, Bluetooth Key Versions, Bluetooth Low Energy (BLE) Protocol, Bluetooth, Low Energy Architecture, PSoC4 BLE
Architecture and Component Overview.

UNIT IV:

Solution framework for IoT applications Implementation of Device integration, Data acquisition and integration, Device data storage Unstructured data storage on cloud/local server, Authentication, authorization of devices.

UNIT V:

IoT Case Studies IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation. Cloud Analytics for IoT Application: Introduction to cloud computing, Difference between Cloud Computing and Fog

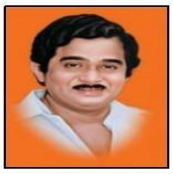
Computing: The Next Evolution of Cloud Computing, Role of Cloud Computing in IoT, Connecting IoT to cloud, Cloud Storage for IoT Challenge in Integration of IoT with Cloud.

Text Books:

1. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education, 2017.
2. The Definitive Guide to the ARM Cortex-M0 by Joseph Yiu,2011.
3. Vijay Madisetti, ArshdeepBahga, Internet of Things, "A Hands on Approach", University Press, 2015.

References:

1. Cypress Semiconductor/PSoC4 BLE (Bluetooth Low Energy) Product Training Modules.
2. Pethuru Raj and Anupama C. Raman, "The Internet of Things



Department of Electronics & Communication Engineering

IV Year I Semester		L	T	P	C
		3	0	0	3
SATELLITE COMMUNICATION (PROFESSIONAL ELECTIVE-4)					

COURSE OBJECTIVES

1) Understand the basic concepts, applications, frequencies used and types of satellite communications.
2) Understand the concept of look angles, launches and launch vehicles and orbital effects in satellite communications.
3) Understand the various satellite subsystems and its functionality.
4) Understand the concepts of satellite link design and calculation of C/N ratio.
5) Understand the concepts of multiple access and various types of multiple access techniques in satellite systems.
6) Understand the concepts of satellite navigation, architecture and applications of GPS.

Course Outcomes:

At the end of this course the student can able to:

1) Understand the concepts, applications and subsystems of Satellite communications.
2) Derive the expression for G/T ratio and to solve some analytical problems on satellite Link design.
3) Understand the various types of multiple access techniques and architecture of earth Station design.
4) Understand the concepts of GPS and its architecture

UNIT I

INTRODUCTION: Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency allocations for Satellite Services, Applications, Future Trends of Satellite Communications.

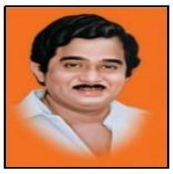
ORBITAL MECHANICS AND LAUNCHERS: Orbital Mechanics, Look Angle determination, Orbital perturbations, Orbit determination, launches and launch vehicles, Orbital effects in communication systems performance**.**

UNIT II

SATELLITE SUB SYSTEMS: Attitude and orbit control system, telemetry, tracking, Command and monitoring, power systems, communication subsystems, Satellite antenna Equipment reliability and Space qualification.

UNIT III

SATELLITE LINK DESIGN: Basic transmission theory, system noise temperature and G/T ratio, Design of down links, up link design, Design of satellite links for specified C/N, System design example.



Department of Electronics & Communication Engineering

UNIT IV

MULTIPLE ACCESS: Frequency division multiple access (FDMA) Intermediation, Calculation of C/N. Time division Multiple Access (TDMA) Frame structure, link design using TDMA, Examples. Satellite Switched TDMA Onboard processing, DAMA, Code Division Multiple access (CDMA), Spread spectrum transmission and reception.

EARTH STATION TECHNOLOGY: Introduction, Transmitters, Receivers, Antennas, Tracking systems, Terrestrial interface, Primary power test methods.

UNIT V

LOW EARTH ORBIT AND GEO-STATIONARY SATELLITE SYSTEMS: Orbit Consideration, coverage and frequency considerations, Delay & Throughput considerations, System considerations, Operational NGSO constellation Designs

SATELLITE NAVIGATION & THE GLOBAL POSITIONING SYSTEM:

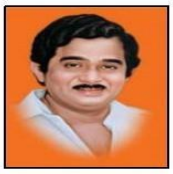
Radio and Satellite Navigation, GPS Position Location principles, GPS Receivers and codes, Satellite signal acquisition, GPS Navigation Message, GPS signal levels, GPS receiver operation, GPS C/A code accuracy, Differential GPS.

TEXT BOOKS:

1) Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition, 2003.
2) Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G. Suyderhoud, 2nd Edition, Pearson Publications, 2003.
3) Digital satellite communication by TRI T HA …..TMH

REFERENCES:

1) Satellite Communications: Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003.
2) Satellite Communication - D.C Agarwal, Khanna Publications, 5th Ed.
3) Fundamentals of Satellite Communications – K.N. Raja Rao, PHI, 2004
4) Satellite Communications – Dennis Roddy, McGraw Hill, 2nd Edition, 1996.



Department of Electronics & Communication Engineering

IV Year – I Semester		L	T	P	C
		3	0	0	3
SOFT COMPUTING TECHNIQUES (PROFESSIONAL ELECTIVE-5)					

Course Outcomes:

1. Develop intelligent systems leveraging the paradigm of soft computing techniques.
2. Implement, evaluate and compare solutions by various soft computing approaches for finding the optimal solutions.
3. Recognize the feasibility of applying a soft computing methodology for a particular problem
4. Design the methodology to solve optimization problems using fuzzy logic, genetic algorithms and neural networks.
5. Design hybrid system to revise the principles of soft computing in various application

UNIT I: Introduction: Approaches to intelligent control, Architecture for intelligent control, Symbolic reasoning system, Rule-based systems, the AI approach, Knowledge representation - Expert systems**.**

UNIT II: Artificial Neural Networks: Concept of Artificial Neural Networks and its basic mathematical model, McCulloch-Pitts neuron model, simple Perceptron, Adeline and Madeline, Feed-forward Multilayer Perceptron, Learning and Training the neural network, Data Processing: Scaling, Fourier transformation, principal-component analysis and wavelet transformations, Hopfield network, Self-organizing network and Recurrent network, Neural Network based controller.

UNIT III: Fuzzy Logic System: Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning, Introduction to fuzzy logic modeling and control, Fuzzification, inferencing and defuzzification, Fuzzy knowledge and rule bases, Fuzzy modeling and control schemes for nonlinear systems, Self-organizing fuzzy logic control, Fuzzy logic control for nonlinear time delay system.

UNIT IV: Genetic Algorithm: Basic concept of Genetic algorithm and detail algorithmic steps, Adjustment of free parameters, Solution of typical control problems using genetic algorithm, Concept on some other search techniques like Tabu search and ant D-colony search techniques for solving optimization problems.

UNIT V: Applications: GA application to power system optimization problem, Case studies: Identification and control of linear and nonlinear dynamic systems using MATLAB-Neural Network toolbox, Stability analysis of Neural Network interconnection

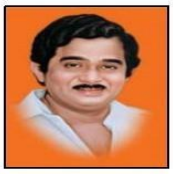
Systems, Implementation of fuzzy logic controller using MATLAB fuzzy-logic toolbox, Stability analysis of fuzzy control systems.

TEXT BOOKS:

1) Introduction to Artificial Neural Systems - Jacek.M.Zurada, Jaico Publishing House, 1999.
2) Neural Networks and Fuzzy Systems - Kosko, B., Prentice-Hall of India Pvt. Ltd., 1994.

REFERENCE BOOKS:

1) Fuzzy Sets, Uncertainty and Information - Klir G.J. &Folger T.A., Prentice-Hall of India Pvt. Ltd., 1993.
2) Fuzzy Set Theory and Its Applications - Zimmerman H.J. Kluwer Academic Publishers, 1994. Introduction to Fuzzy Control - Driankov, Hellendroon, Narosa Publishers.Artificial Neural Networks - Dr. B. Yagananarayana, 1999, PHI, New Delhi.
3) Elements of Artificial Neural Networks - KishanMehrotra, Chelkuri K. Mohan,Sanjay Ranka, Penram International.
4) Artificial Neural Network –Simon Haykin, 2nd Ed., Pearson Education.
5) Introduction Neural Networks Using MATLAB 6.0 - S.N. Shivanandam, S. Sumati, S. N. Deepa, 1/e, TMH, New Delhi



Department of Electronics & Communication Engineering

IV Year I Semester		L	T	P	C
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DIGITAL IC DESIGN USING CMOS (PROFESSIONAL ELECTIVE-5)					

OBJECTIVES

1) The student will be able to understand the MOS Design.
2) In this course, students can study Combinational MOS Logic
3) Circuits and Sequential MOS Logic Circuits.
4) Another main object of this course is to motivate the graduate students to design and to develop the Digital Integrated Circuits for different Applications.
5) The concepts of Semiconductor Memories, Flash Memory, RAM array organization.

Course Outcomes:

After going through this course the student will be able to

1) Understand the concepts of MOS Design.
2) Design and analysis of Combinational and Sequential MOS Circuits.
3) Extend the Digital IC Design to Different Applications.
4) Understand the Concepts of Semiconductor Memories, Flash Memory, RAM array organization

UNIT-I:

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

UNIT-II:

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

UNIT-III:

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

UNIT-IV:

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

UNIT-V:

Interconnect: Capacitive Parasitic, Resistive Parasitic, Inductive Parasitic, Advanced Interconnect Techniques. Semiconductor Memories: Memory Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation

Leakage currents in SRAM cells, Flash Memory- NOR flash and NAND flash. Designing Memory and Array Structures: Introduction, Memory Classification, Memory Architectures and Building Blocks**,** The Memory Core, Read Only Memories, Non-volatile Read-Write Memories, Read- Write Memories (RAM), **Contents** Addressable or Associative Memory (CAM), Memory Peripheral Circuitry, The Address Decoders, Sense Amplifiers, Voltage References, Drivers/Buffers, Timing and Control.

Text Books:

1) Digital Integrated Circuits – A Design Perspective, Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, 2nd Ed., PHI.
2) Digital Integrated Circuit Design – Ken Martin, Oxford University Press, 2011.

References:

1) CMOS Digital Integrated Circuits Analysis and Design – Sung-Mo Kang, YusufLeblebici, TMH, 3rd Ed., 2011.
2) CMOS VLSI Design – Neil H.E Weste, David harris, Ayan Banerjee 3rd Edition,Pearson

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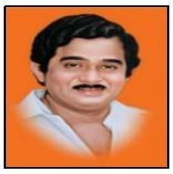

Department of Electronics & Communication Engineering

IV Year I Semester		L	T	P	C
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SMART MANUFACTURING (OPEN ELECTIVE-IV)					

Course objectives:

1) To understand concepts of smart manufacturing.
2) To gain knowledge about smart machines and sensors.
3) To understand the principles of IoT connectivity to industry 4.0.
4) To acquire knowledge about digital twin and its applications and machine learning and artificial intelligence in manufacturing.
5) To understand the basic concepts of met averse

Course Outcomes:

1) At the end of the course, student will be able to
2) CO1: Apply the basic concepts of smart manufacturing.
3) CO2: Analyze about smart machines and sensors.
4) CO3: Utilize the principles of IoT connectivity to industry 4.0.
5) CO4: Perceive about digital twin and its applications and machine learning and artificial intelligence in manufacturing.
6) CO5: Learn the basic concepts of metaverse.

UNIT-I

Concepts of Smart Manufacturing: Definition and key characteristics of smart manufacturing, corporate adaptation processes, manufacturing challenges, challenges vs. technologies, Stages in smart manufacturing. Minimizing six big losses in manufacturing with Industry 4.0, and their benefits

UNIT-II

Smart Machines and Smart Sensors: Concept and Functions of a Smart, Machine Salient features and Critical Subsystems of a Smart Machine, Smart sensors; smart sensors ecosystem, need, benefits and applications of sensors in industry, introduction to IoT, IIoT, and Cyber physical systems, Sensing for Manufacturing Process in IIoT, Block Diagram of an IoT Sensing Device, Sensors in IIoT Applications, Smart Machine Interfaces.

UNIT-III

IoT connectivity for Industry 4.0: Industrial communication requirement and its infrastructure, an overview of different types of networks, mesh network in industrial IoT, IoT protocols and the internet, TCP/IP (transmission control protocol/internet protocol) model, IoT connectivity standards: common protocols, application layer protocols, internet/network layer protocols, physical layer IoT protocols, choosing the right IoT connectivity protocol.

UNIT-IV

Digital Twin: Introduction, applications of digital twins, impact zones of digital twins in manufacturing (factories/plants and OEMs), advantages of digital twins, basic steps of digital twin technology

Machine Learning (ML) and Artificial Intelligence (AI) in Manufacturing: Introduction, benefits and applications of ML in industries, common approaches of ML; supervised and unsupervised, semi-supervised and reinforced ML

UNIT-V

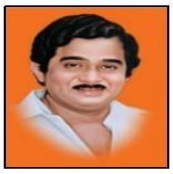
Metaverse –DEPARTMENT OF MECHANICAL ENGINEERING Basic concepts, AR/VR, Social Metaverse, Industrial Metaverse, How Web 3.0 is changing the Internet, Asset Classes Inside the Metaverse, Land, Coins, Characters/ Avatars, Skins, Utility, Industries Disrupted by the Metaverse, Smart wearable's,

TEXT BOOKS:

1) Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 2/e, Pearson Education, 2010.
2) Tom M. Mitchell, Machine Learning, McGraw Hill, 2013.
3) Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning), the MIT Press, 2004.
4) AurélienGéron, Hands on Machine Learning with Scikit-Learn and TensorFlow [Concepts, Tools, and Techniques to Build Intelligent Systems], Published by O'Reilly Media, 2017.
5) Artificial Intelligence and Machine Learning, Principles and applications by Vinod Chandra S.S., Anand Hareendran S., PHI.

REFERENCE BOOKS:

1) Elaine Rich, Kevin Knight and Shiva Shankar B. Nair, Artificial Intelligence, 3/e, McGraw Hill Education, 2008.
2) Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems, PHI Learning, 2012.
3) MACHINE LEARNING: A PRACTITIONER'S APPROACH, by Vinod Chandra S.S., Anand Hareendran S., PHI.
4) M.C. Trivedi, A Classical Approach to Artifical Intelligence, Khanna Publishing House,New Delhi, 2018.
5) S. Kaushik, Artificial Intelligence, Cengage Learning India, 2011.



Department of Electronics & Communication Engineering

IV Year I Semester		L	T	P	C
		3	0	0	3

POWER SYSTEM ENGINEERING
(OPEN ELECTIVE-IV)

Course Objectives:

1. To understand the types of electric power plants and their working principles.
2. To understand the concepts of electric power transmission and distribution.
3. To gain the knowledge of protection and grounding of power system components.
4. To know the economic aspects of electrical energy.
5. To learn the importance of power factor improvement and voltage control.

Course Outcomes:

1. After the completion of the course the student should be able to:
2. Know the concepts of power generation by various types of power plants.
3. Learn about transmission line concepts and distribution systems schemes.
4. Learn about protection equipments and grounding methods of power system.
5. Know the economic aspects of electrical energy and their importance.
6. Know the importance of power factor improvement and voltage control in power systems.

UNIT - I

Power Generation Concepts & Types

Generation and sources of Energy – working principle and Schematic diagram approach of Thermal Power Plant – Hydro Power Plant - Nuclear Power Plant – Gas Power Plants – Comparison between Power Plants.

UNIT - II

Transmission and Distribution Concepts

Types of Conductors Materials – Constants of Transmission Line – Classification of Overhead Transmission Lines – Performance of Short Transmission Lines – Simple Problems. Basic concept of Sub Station – Distribution Systems – Connection Schemes of Distribution Systems – Structure of Cables – Differences between Overhead & Underground systems.

UNIT - III

Protection and Grounding

List of Faults – Basic concepts of fuse – Circuit Breakers – Relays – SF6 Circuit Breakers – Vacuum Circuit Breakers – Operation of Lightning Arrester – Grounding and its advantages - Methods of Neutral Grounding: Resistance - Reactance and Resonant Grounding – Numerical Problems.

UNIT - IV

Economic Aspects

Definitions of Load - Load & Load Duration Curves - Load Factor - Demand Factor – Utilization Factor – Types of Tariff - Cost of Electrical Energy – Expression for Cost of Electrical Energy – Numerical Problems

UNIT - V

Power Factor Improvement and Voltage Control

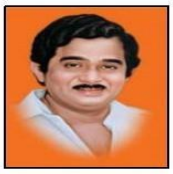
Power Factor – Effects and Causes of low Power Factor- Shunt & Series Capacitor Compensation -Numerical Problems – Need of Voltage Control – Types of Voltage regulating Devices.

Text Books:

1. Principles of Power System by V.K.Mehata - Rohit Mehata - S.Chand Publishers.

Reference Books:

1. Electrical Power Systems by C.L.Wadwa - New Age International Publishers



Department of Electronics & Communication Engineering

IV Year II Semester		L	T	P	C
		3	0	0	3
Artificial Neural Networks (OPEN ELECTIVE-IV)					

The main objectives of this course are:

1. To provide an introduction to the field of artificial neural networks and machine learning.
2. To teach students how to solve practical problems via implementation of these techniques
3. Via simulation.
4. To promote further independent learning on the topics of artificial neural networks and machine learning.

Course Outcomes:

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

1. Survey of attractive applications of Artificial Neural Networks.
2. practically approach for using Artificial Neural Networks in various technical, organizational and economical applications

UNIT-I:

INTRODUCTION: History of Neural Networks, Structure and Functions of Biological and Artificial Neuron, Neural Network Architectures, Characteristics of ANN, Basic Learning Laws and Methods.

UNIT-II:

SUPERVISED LEARNING: Single Layer Neural Network and architecture, McCulloch-Pitts Neuron Model, Learning Rules, Perceptron Model, Perceptron Convergence Theorem, Delta learning rule, ADALINE, Multi-Layer Neural Network and architecture, MADALINE, Back Propagation learning, Back Propagation Algorithm

UNIT-III:

UNSUPERVISED LEARNING-1: Outstar Learning, Kohenen Self Organization Networks, Hamming Network and MAXNET, Learning Vector Quantization, Mexican hat.

UNIT-IV:

UNSUPERVISED LEARNING-2: Counter Propagation Network -Full Counter Propagation network, Forward Only Counter Propagation Network, Adaptive Resonance Theory (ART) - Architecture, Algorithms.

UNIT V:

ASSOCIATIVE MEMORY NETWORKS: Introduction, Auto Associative Memory, Hetero Associative Memory, Bidirectional Associative Memory(BAM) -Theory and Architecture, BAM

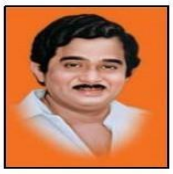
Training Algorithm, Hopfield Network: Introduction, Architecture of Hopfield Network.

TEXT BOOKS:

1) B. Yegnanarayana" Artificial neural networks" PHI, New Delhi.
2) S.N. Sivanandam, S.N. Deepa, "Introduction to Neural Networks using MATLAB6.0", TATA MCGraw- Hillpublications.
3) J.M. Zurada," Introduction to Artificial neural systems" –Jaicopublishing.

REFERENCE BOOKS:

1) S.Rajasekaran and G.A.Vijayalakshmipai "Neural Networks.Fuzzy Logicand genetic Algorithms".
2) James A Freeman and Davis Skapura" Neural Networks Algorithm, applications and programming Techniques", Pearson Education, 2002.
3) Simon Hakins "Neural Networks " Pearson Education.

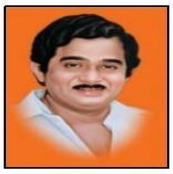


Department of Electronics & Communication Engineering

IV Year I Semester		L	T	P	C
		0	0	4	2
INTERNET OF THINGS LAB					

LIST OF EXPERIMENTS

1. Introduction to Raspberry Pi Board/ Arduino/Node MCU
2. Familiarization with ARM Keil MDK for programming and debugging an application on the PSoC 4 BLE chip and perform necessary software installation.
3. To interface Push button/Digital sensor (IR/LDR) with ARM keil MDK on PSoC 4 BLE chip and write a program to turn ON LED when push button is pressed or at sensor detection
4. Set up a Bluetooth Low Energy (namely Bluetooth Smart) connection between the PSoC BLE kit and a smart phone and use an app to send and receive data to and from the BLE Pioneer kit.
5. To interface capacitor sensor (touch sensor) with smart phone and write a program to turn RGB LED ON/OFF when '1'/'0' is received from smart phone using blue tooth
6. Automatic Street light control to control the street light (Turn on and off based on the light) using Arduino/ Node MCU/Raspberry Pi
7. Smoke Detection using MQ-2 Gas Sensor
8. Detecting obstacle with IR Sensor and Arduino/ Node MCU/Raspberry Pi
9. Arduino board interfacing with the temperature and humidity sensor and prints the output on LCD / serial monitor
10. Write an Arduino program for interfacing Arduino board with the Ultrasonic sound sensor and print the output on Serial monitor



Department of Electronics & Communication Engineering

IV Year – I SEMESTER		L	T	P	C
		3	0	0	3
CONCEPTS OF SMART GRID TECHNOLOGIES (OPEN ELECTIVE-IV)					

Course Objectives:

1. To understand the basic concepts of smart grid.
2. To understand various smart grid technologies and its usage in smart applications.
3. To realize substation automation with intelligent sensors and have an ideaon battery energy storage systems.
4. To have basic knowledge on micro grids and DG's.
5. To have an idea on communication technologies used in smart grid.

Course Outcomes:

After the completion of the course the student should be able to:

1. Know the concepts of smart grids and analyse the smart grid policies anddevelopments in smart grids.
2. Develop concepts of smart grid technologies in hybrid electrical vehicles etc.
3. Know the concepts of smart substations - feeder automation - BatteryEnergy storage systemsetc.
4. Analyse micro grids and distributed generation systems.
5. Analyse the effect of power quality in smart grid and to understand latestdevelopments in ICT for smart grid.

UNIT – I

Introduction to Smart Grid Evolution of Electric Grid - Concept of Smart Grid - Definitions - Need of Smart Grid - Functions of Smart Grid - Opportunities & Barriers of Smart Grid - Difference between conventional & smart grid - Concept of Resilient & Self-Healing Grid - Present development & International policies on Smart Grid.

UNIT – II

Smart Grid Technologies: Part 1Introduction to Smart Meters - Real Time Pricing - Smart Appliances – Automatic Meter Reading(AMR) - Outage Management System(OMS) - Plug in Hybrid Electric Vehicles(PHEV) - Vehicle to Grid - Smart Sensors - Home & Building Automation - Phase Shifting Transformers - Net Metering.

UNIT – III

Smart Grid Technologies: Part 2Smart Substations - Substation Automation - Feeder Automation. Geographic Information System (GIS) -Intelligent Electronic Devices (IED) & their application for monitoring & protection. Smart storage like Battery Energy Storage Systems (BESS) - Super Conducting Magnetic Energy Storage Systems (SMES) - Pumped Hydro - Compressed Air Energy Storage (CAES)

UNIT – IV

Micro grids and Distributed Energy Resources Concept of micro grid - need & applications of micro grid - formation of micro grid - Issues of interconnection - protection & control of microgram - Integration of renewable energy sources - Demand Response.

UNIT - V

Information and Communication Technology for Smart Grid Advanced Metering Infrastructure (AMI) - Home Area Network (HAN) - Neighborhood Area Network (NAN) - Wide Area Network (WAN).

Text Books:

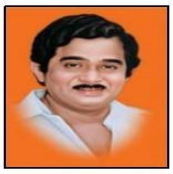
1. Integration of Green and Renewable Energy in Electric Power Systems - By Ali Keyhani -Mohammad N. Marwali - Min Dai Wiley - 2009.
2. The Smart Grid: Enabling Energy Efficiency and Demand Response - by Clark W.Gellings -Fairmont Press - 2009.
3. 3. Smart Grid: Technology and Applications - by Janaka B. Ekanayake - Nick Jenkins - KithsiriLiyanage - Jianzhong Wu - Akihiko Yokoyama - Wiley publishers - 2012.
4. Smart Grids by Jean-Claude Sabonnadière - NouredineHadjsaïd - Wiley publishers –2013.
5. Smart Power: Climate Changes - the Smart Grid - and the Future of ElectricUtilities - by Peter S. Fox Penner - Island Press; 1st edition - 8 Jun 2010
6. Microgrids and Active Distribution Networks by S. Chowdhury - S. P. Chowdhury - P.Crossley - Institution of Engineering and Technology - 30 Jun 2009

Reference Books:

1. The Advanced Smart Grid: Edge Power Driving Sustainability:1 by Andres Carvallo - JohnCooper - Artech House Publishers July 2011
2. Control and Automation of Electric Power Distribution Systems (Power

Engineering) by JamesNorthcote - Green - Robert G. Wilson - CRC Press - 2017.

3. Substation Automation (Power Electronics and Power Systems) by Mladen Kezunovic - Mark G.Adamiak - Alexander P. Apostolov - Jeffrey George Gilbert -Springer - 2010.
4. Electrical Power System Quality by R. C. Dugan - Mark F. McGranghan - SuryaSantoso - H.Wayne Beaty - McGraw Hill Publication - 2nd Edition.



Department of Electronics & Communication Engineering

IV Year – II SEMESTER		L	T	P	C
		3	0	0	3
FUNDAMENTALS OF ELECTRIC VEHICLES (OPEN ELECTIVE-IV)					

Course Objectives:

1. To familiarize the students with the need and advantages of electric and hybrid electric vehicles.
2. To understand various power converters used in electric vehicles.
3. To know various architecture of hybrid electric vehicles.
4. To be familiar all the different types of motors suitable for electric vehicles.
5. To have knowledge on latest developments in strategies and other storage systems.

Course Outcomes:

1. After the completion of the course the student should be able to:
2. Illustrate different types of electric vehicles.
3. Select suitable power converters for EV applications.
4. Design HEV configuration for a specific application.
5. Choose an effective method for EV and HEV applications.
6. Analyze a battery management system for EV and HEV.

UNIT – I

Introduction Fundamentals of vehicles - Components of conventional vehicles - drawbacks of conventional vehicles need for electric vehicles - History of Electric Vehicles – Types of Electric Vehicles – Advantages and applications of Electric Vehicles.

UNIT – II

Components of Electric Vehicles Main components of Electric Vehicles – Power Converters - Controller and Electric Traction Motor – Rectifiers used in EVs – Bidirectional DC–DC Converters – Voltage Source Inverters – PWM inverters used in EVs.

UNIT – III

Hybrid Electric Vehicles Evolution of Hybrid Electric Vehicles – Advantages and Applications of Hybrid Electric Vehicles – Architecture of HEVs - Series and Parallel HEVs – Complex HEVs – Range extended HEVs – Examples - Merits and Demerits.

UNIT – IV

Motors for Electric Vehicles Characteristics of traction drive - requirements of electric machines for EVs – Different motors suitable for Electric and Hybrid Vehicles – Induction Motors – Synchronous Motors – Permanent Magnetic Synchronous Motors – Brushless DC Motors – Switched Reluctance Motors (Construction details and working only)

UNIT – V

Energy Sources for Electric Vehicles Batteries - Types of Batteries – Lithium-ion - Nickel-metal hydride - Lead-acid – Comparison of Batteries - Battery Management System – Ultra capacitors – Flywheels – Fuel Cell – it's working.

Text Books

1. Iqbal Hussein - Electric and Hybrid Vehicles: Design Fundamentals - CRC Press - 2021.
2. Denton - Tom. Electric and hybrid vehicles. Routledge - 2020.

Reference Books:

1. Kumar - L. Ashok - and S. Albert Alexander. Power Converters for Electric Vehicles. CRC Press - 2020.
2. Chau - Kwok Tong. Electric vehicle machines and drives: design - analysis and application. John Wiley & Sons - 2015.
3. Berg - Helena. Batteries for electric vehicles: materials and electrochemistry. Cambridge university press - 2015.
4. NPTEL \ SWAYAM.

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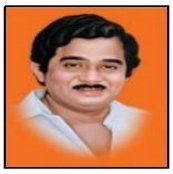


Department of Electronics & Communication Engineering

IV Year – I SEMESTER		L	T	P	C
		3	0	0	3
BLOCK CHAIN ARCHITECTURE DESIGN AND USE CASES (OPEN ELECTIVE-IV)					

Course Objectives:

By the end of the course, students will be able to x Understand how block chain systems (mainly Bit coin and Ethereum) work and to securely interact with them, x Design, build, and deploy smart contracts and distributed applications, x Integrate ideas from block chain technology into their own projects.

Course Outcomes:

At the end of the course, student will be able to x Demonstrate the foundation of the Block chain technology and understand the processes in payment and funding.

1. Identify the risks involved in building Block chain applications.
2. Review of legal implications using smart contracts.
3. Choose the present landscape of Block chain implementations and Understand Crypto currency markets
4. Examine how to profit from trading crypto currencies.

UNIT I

Introduction, Scenarios, Challenges Articulated, Block chain, Block chain Characteristics, Opportunities Using Block chain, History of Block chain. Evolution of Block chain: Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Block chain Evolution, Consortia, Forks, Public Block chain Environments, Type of Players in Block chain Ecosystem, Players in Market.

UNIT II

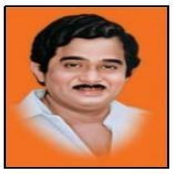
Block chain Concepts: Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on block chain, data storage on block chain, wallets, coding on block chain: smart contracts, peer-to-peer network, types of block chain nodes, risk associated with block chain solutions, life cycle of block chain transaction.

UNIT III

Architecting Block chain solutions: Introduction, Obstacles for Use of Block chain, Block chain Relevance Evaluation Framework, Block chain Solutions Reference Architecture, Types of Block chain Applications. Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Block chain Solutions, Architecture Considerations, and Architecture with Block chain Platforms, Approach for Designing Block chain Applications.

UNIT IV

Ethereum Block chain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, MyEtherWallet, Ethereum Networks/Environments, Infura, Etherscan, Ethereum Clients, Decentralized Application, Metamask, Tuna Fish Use Case Implementation, Open Zeppelin Contracts



Department of Electronics & Communication Engineering

UNIT V

Hyper ledger Block chain Implementation, Introduction, Use Case – Car Ownership Tracking, Hyper ledger Fabric, Hyper ledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chain code Functions Using Client Application. Advanced Concepts in Block chain: Introduction, Interplanetary File System (IPFS), Zero-Knowledge Proofs, Oracles, Self-Sovereign Identity, Block chain with IoT and AI/ML Quantum Computing and Block chain, Initial Coin Offering, Block chain Cloud Offerings, Block chain and its Future Potential.

Text Books:

1) Ambadas, Arshad Sarfarz Ariff, Sham "Block chain for Enterprise Application Developers", Wiley 2) Andreas M. Antonpoulos, "Mastering Bit coin: Programming the Open Block chain" , O'Reilly

Reference Books:

1) Block chain: A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph Bambara, Paul R. Allen, Mc Graw Hill. 2) Block chain: Blueprint for a New Economy, Melanie Swan, and O'Reilly