YESHWANTRAO CHAVAN COLLEGE OF ENGINEERING

B.E. (Electronics Engineering)

SCHEME OF EXAMINATION

Sl.No.	Subject		L	T	P	Total Contact Hours	Credits	% Weightage				ESE Duration
								MSE - I	MSE - II	TA	ESE	
SEMESTER VII												
1	GE404	Engineering Economics	3	0	0	3	3	15	15	10	60	3 Hrs
2		Prof. Elective 2	4	0	0	4	4	15	15	10	60	3 Hrs
3		Prof. Elective 2 Laboratory	0	0	2	2	1			40	60	
4	EE407	Electronics Circuit Design	3	1	0	4	4	15	15	10	60	3 Hrs
5	EE408	Electronics Circuit & Design Laboratory	0	0	2	2	1			40	60	
6	EE409	Digital Communication	4	0	0	4	4	15	15	10	60	3 Hrs
7	EE410	Digital Communication Laboratory	0	0	2	2	1			40	60	
8		Free Elective 2	4	0	0	4	4	15	15	10	60	3 Hrs
9	EE412	Project Phase 1	0	0	4	4	4			40	60	
10	EE413	Industrial Training	0	0	0	0	2			100		
		Total	**18**	**1**	**10**	**29**	**28**					

EE401	PE 2 : Embedded System	4	0	0	4	4	15	15	10	60	
EE402	PE 2 :Embedded System Laboratory	0	0	2	2	1			40	60	
EE403	PE 2 :Digital CMOS Circuits	4	0	0	4	4	15	15	10	60	
EE404	PE 2 :Digital CMOS Circuits Laboratory	0	0	2	2	1			40	60	
EE405	PE 2 :Algorithm & Data Structure	4	0	0	4	4	15	15	10	60	
EE406	PE 2 :Algorithm & Data Structure Laboratory	0	0	2	2	1			40	60	

EL412	FE2 : Electrical Energy Audit and Safety	4	0	0		4	15	15	10	60	
EL413	FE2 : Utilisation of Electrical Energy	4	0	0		4	15	15	10	60	
CV418	FE 2 : Elements of Earthquake Engineering	4	0	0	4	4	15	15	10	60	
CV419	FE 2 : Air Pollution & Solid Waste Management	4	0	0	4	4	15	15	10	60	
ME429	FE 2 : Total Quality Management	4	0	0	4	4	15	15	10	60	
ME430	FE 2 : Reliability Engineering	4	0	0	4	4	15	15	10	60	
CT411	FE2 : Multimedia and Animation	4	0	0	4	4	15	15	10	60	100
CT412	FE2 : Current Trends and Technologies	4	0	0	4	4	15	15	10	60	100
IT408	FE2 : Applications of Computer Networking	4	0	0	4	4	15	15	10	60	3 Hrs

SEMESTER VIII												
1	GE405	Engineering Management	3	0	0	3	3	15	15	10	60	3 Hrs
2		Prof. Elective 3	4	0	0	4	4	15	15	10	60	3 Hrs
3		Prof. Elective 4	3	1	0	4	4	15	15	10	60	3 Hrs
4		Prof. Elective 4 Laboratory	0	0	2	2	1			40	60	
5		Prof. Elective 5	4	0	0	4	4	15	15	10	60	3 Hrs
6		Prof. Elective 5 Laboratory	0	0	2	2	1			40	60	
7	EE433	(EDA)Electronics Design Automation Laboratory	0	0	2	2	1			40	60	
8	EE430	Comprehensive Viva-voce	0	0	0	0	2			40	60	
9	EE431	Extra Curricular / Competitive Exam	0	0	0	0	2			100		
10	EE432	Project Phase 2	0	0	6	6	6			40	60	
		Total	**14**	**1**	**12**	**27**	**28**					

EE414	PE 3 : Computer Communication Network	4	0	0	4	4	15	15	10	60	
EE415	PE 3 :Operating System Concepts	4	0	0	4	4	15	15	10	60	
EE416	PE 3 :Biomedical Instrumentation	4	0	0	4	4	15	15	10	60	

EE417	PE 4 :Soft Computing	3	1	0	4	4	15	15	10	60	
EE418	PE 4 :Soft Computing Laboratory	0	0	2	2	1			40	60	
EE419	PE 4 :Analog VLSI Design	3	1	0	4	4	15	15	10	60	
EE420	PE 4 :Analog VLSI Design Laboratory	0	0	2	2	1			40	60	
EE421	PE 4 :Optical Communication	3	1	0	4	4	15	15	10	60	
EE422	PE 4 :Optical Communication Laboratory	0	0	2	2	1			40	60	

EE423	PE 5 :Object Oriented Programming	4	0	0	4	4	15	15	10	60	
EE424	PE 5 :Object Oriented Programming Laboratory	0	0	2	2	1			40	60	
EE425	PE 5 :Wireless Communication	4	0	0	4	4	15	15	10	60	
EE426	PE 5 :Wireless Communication Laboratory	0	0	2	2	1			40	60	
EE427	PE 5 :Digital Image Processing	4	0	0	4	4	15	15	10	60	
EE428	PE 5 :Digital Image Processing Laboratory	0	0	2	2	1			40	60	

Chairperson		**Date of Release**	May 2013	**Applicable for**
Dean (Acad. Matt.)		**Version**	**1.03**	**AY 2013-14 Onwards**

GE404/ GE607	Engineering Economics			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total		ESE Duration
	15	15	10	60	100		3 Hrs

Objective	Outcome
➢ The major learning objectives are to understand of the Economics of Engineering, which includes the Time Value of money and the Mathematics of Finance.	➢ It helps in analyzing the various types of demand which enable the students to arrive at reasonable estimates of demand for product of his company. ➢ As a studying marketing & finance often helps us become more savvy consumers. ➢ It is more concerned with decision making to make the best under a given situations & to be ethically and socially responsive to the needs of society . ➢ It helps to formulating strategies to exploit rewarding opportunities thereby maximizing its return on investment. ➢ Students are expected to understand & demonstrate the effect of time value of money, depreciation & foreign currency, trade.
Mapped Program Outcomes :c,h,i,j	

UNIT-1: Importance of Economics, concept of macro & micro economics, Demand Utility and Indifference curves, Approaches to analysis of demand, Elasticity of demand, Measures of demand elasticity Factors of production. Advertising elasticity, Marginalism.
UNIT-2: Factors of Production, Laws of returns and costs, Price and output determination under perfect competition, Monopoly, Monopolistic competition, oligopoly, Depreciation and methods for its determination.

UNIT-3 Value of money, index numbers, inflation, deflation stagflation, nature and meaning of economic development and growth, role of capital accumulation in economic development.

UNIT-4: Functions of central and commercial banks Inflation, Deflation, Stagflation, Direct and Indirect taxes. . Monetary and cycles, new economic policy, Liberalisation, Globalisation, privatization, market friendly state, fiscal policy of the government, Meaning and phases of business.

UNIT-5 Sources of public revenue, classification of taxes, direct taxes, indirect taxes, income of wealth and expenditure , corporation tax, tax on business , taxation and functions of money market, bills of exchange, hundis
UNIT-6: Pattern and composition of India's foreign trade, Free Trade, Trade Vs Protection , Export Promotion, Foreign Exchange Market, Methods and objectives of exchanges control, IMF, IBRD, GATT

Text books:				
1	Modem Economics	13th EditionDate: 2009.	by H.L. Ahuja	S. Chand Publisher
2	Modem Economic Theory	3rd edition Date: 2007	by K.K. Dewett.	S. Chand Publisher
3	Monetary Economics	Edition1990	by M.L. Seth	Lakshmi NarainAgrawal
4	Industrial Management		by I.K. Chopde, A.M. Sheikh.	

Reference books:				
1	Business Organization and Management	2002	S.A. Sherlekar	
2	Managerial Economics	Sixth Edition, 1968	Joel Dean.	New Delhi : Prentice Hall of India Private Ltd.
3	Managerial Economics	2010. Edition, Third	Pylee.	Government Publications
4	Economics		Samuelson.	

Chairperson		Date of Release	May 2013	Applicable for AY 2013-14 Onwards
Dean (Acad. Matters)		Version	1.00	

EE401 / EE711	Embedded System	L= 4	T = 0	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcome
➢ To understand the concept of Embedded System, ARM Architecture & RTOS. ➢ To understand different functional blocks like ADC, DAC, RTC,I2C etc. ➢ To understand device programming concepts.	➢ Students will be familiar with ARM7 architecture. ➢ Student will be able to program ADC, DAC, etc. Also able to interface & program different peripheral devices like LCD, Keys, seven segment etc. ➢ Student will be able to design a system, components or process as per the needs & specifications.
Mapped Program Outcomes: b,d,e,i,l,m	

UNIT-1:
Introduction to ARM, Advantages of architectural features of ARM Processor, Processor modes, Register organization, Exceptions and its handling, 3/5- stage pipeline ARM organization.
UNIT-2:
Memory and memory-mapped I/Os, ARM and THUMB instruction sets, ARM programmer's model, addressing modes, Instruction set in detail and programming, data processing instruction, data transfer instruction, Control flow instructions, simple assembly language programs.
UNIT-3
ARM floating point architecture, Memory buses: AMBA, ASB, & APB. Architectural support for system development.
UNIT-4:
DMA Architecture, Memory Hierarchy, memory size and speed, on-chip memory, caches, cache design, memory management.
UNIT-5
Architectural support for operating system, RTOS issues, µCOS-II and embedded Linux features, the shared Data Problem, Software Architectures (Round Robin, Round Robin with Interrupts, Function Queue Scheduling,),Selecting a software Architecture, Introduction to RTOS :tasks and task states, tasks and data, semaphores and shared data, message queues, mailboxes and pipes, events, RT Linux.
UNIT-6:
Case for Real Time Operating System, Embedded ARM applications such as USB interface, Bluetooth, Ethernet.

Text books:

1	ARM System–on-chip Architecture	2nd edition, 2000	Steve Furber	Pearson Education Asia
2	Embedded Linux, Hardware, Software and interfacing	2002.	Craig Hallabaugh	Addison-Wesley Professional
3	ARM System Developer's Guide: Designing and Optimizing	2005	Sloss Andrew N, Symes Dominic & Wright Chris	Morgan Kaufman Publication

Reference books:

1	Technical references on www.arm.com.
2	Web base resources for RTOS and µCOS.

EE402 / EE712	Embedded system Laboratory	L = 0	T = 0	P = 2	Credits = 1

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	40	60	100	

Objective	Outcome
➢ To familiar with RARM7 software & KITS. ➢ To enhance the ability of logical thinking so that student will be design an algorithm and program for a specific task .	➢ Student will be able to understand different instruction used in programming. ➢ Student will be able to design Effective algorithm design for specific experiment. ➢ Student will be perfume experiments on different peripheral devices like LCD, Seven segment, GSM, etc.
Mapped Program Outcomes: b,d,e,i,l,m	

Expt. No.	Name of Experiment (Any Ten)
1	To swap data byte
2	To perform addition, subtraction of 16 bit number
3	To find larger of a two numbers.
4	To perform factorial of a given number
5	To perform ON/OFF LED and show status of LED on LCD
6	To display number from 0 to 9 on seven segment display.
7	To ON/OFF LED using Switch.
8	To rotate a stepper motor in clockwise & anti-clock wise direction with equal delay.
9	To Perform experiment on DAC of LPC2103
10	To read ADC and display value on LCD.
11	To find 1's complements of a given number.
12	Study of RTOS
13	Write device driver for UART.
14	Modify scheduler in such a way that it will assign highest priority to keypad.
15	To read values from RTC and display on LCD.
16	To send SMS to any mobile number.
17	Interface pen drive for writing predefined file.

EE403 / EE713	Digital CMOS circuits	L= 4	T = 0	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

OBJECTIVES	OUTCOMES
➢ To introduce the students to the fundamentals of CMOS circuits. ➢ To learn the modeling of circuits, circuit characterization and performance extraction. ➢ To understand basic electrical properties of MOS circuits and the design process at gate level and subsystem level. ➢ To give basic understanding of Layout rules.	➢ To learn the basics of MOS Circuits. ➢ To learn the various MOS Process Technologies. ➢ Students are expected to design circuits using different CMOS styles and also to do analysis on CMOS structures. ➢ To learn the physical layout of standard and compound Gates. ➢ Understanding electrical Properties and modeling of Very Large Scale Integrated Circuits in order to design the large systems. ➢ Graduates will demonstrate the ability to design a system, component or process as per needs and specifications.
Mapped Program Outcomes: b,c,k,l,m	

UNIT-1:
Introduction of MOSFETs:MOS Physics, NMOS Enhancement Transistor, MOS Transistor Operations, PMOS Enhancement Transistor, Regions of Operations, Threshold Voltage, MOS Device Equations, Small Signal Modeling of MOSFETs.

UNIT-2:
Physical Structure and Fabrication of CMOS IC : Integrated Circuit Layers, MOSFETs, CMOS Layers, Overview of Silicon Processing, N-Well Process, P-Well Process, Basic Physical Design of Simple Logic Gates, Stick Diagram, Euler's Path, Twin Tub Process, Silicon on Insulator (SOI) Process, Latch-up Effect.

UNIT-3:
Logic Design With MOSFETs: Ideal Switches and Boolean Operations, MOSFETs as Switches, Basic Logic Gates in CMOS, Compound Gates in CMOS, Transmission Gate Circuits (TG), Pass Transistor, Multiplexers.

UNIT-4:
MOS inverter Characteristics: Resistive load inverter, Inverters with n type MOSFET load, CMOS inverter, Principle of operation, DC characteristics, Tristate Inverter, Noise Margin, Introduction to Bi-CMOS Inverter.

UNIT-5 :
Analysis of CMOS Logic Gates: MOS Device Capacitance, Switching Characteristics, Rise Time, Fall Time, Propagation Delay, Power Dissipation in CMOS, Charge Sharing, Fan-in, Fan-out, Combinational circuit design, static CMOS, Ratioed Logic circuits, sequential circuit, Latches and Flip Flops.

UNIT-6:
Advanced Techniques in CMOS Logic Circuits: Complex Logic Structures, Complementary Static CMOS, Pseudo NMOS Logic, Dynamic CMOS Logic, CMOS Domino Logic, CMOS Pass Transistor Logic and Flip-Flops.

Text books:				
1	Introduction to VLSI Circuits and Systems	First Edition	John P. Uyemura	Wiley Publication
2	Principle of CMOS VLSI Design	2nd Edition, 1994	Neil H. E. Weste, K. Eshraghian	Addison Wesley VLSI Series
Reference books:				
1	CMOS VLSI Design	3rd Edition, 2005	Pucknell , K. Eshraghian	Prentice Hall
2	CMOS Digital Integrated circuits Analysis and Design	Third edition, 2008	Sung-Mo Kang, Yusuf leblebici	TataMcGraw Hill

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EE404 / EE714	Digital CMOS Circuits Laboratory	L = 0	T = 0	P = 2	Credits = 1

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	40	60	100	

OBJECTIVES	OUTCOMES
➢ To introduce the students to the fundamentals of CMOS circuits. ➢ To understand basic electrical properties of MOS circuits and the design process at gate level and subsystem level. ➢ To give basic understanding of Layout rules.	➢ To learn the basics of MOS Circuits. ➢ To learn the various MOS Process Technologies. ➢ Students are expected to design circuits using different CMOS styles and also to do analysis on CMOS structures. ➢ To learn the physical layout of standard and compound Gates. ➢ Understanding electrical Properties and modeling of Very Large Scale Integrated Circuits in order to design the large systems. ➢ Graduates will demonstrate the ability to design a system, component or process as per needs and specifications.
Mapped Program Outcomes: b,c,k,l,m	

Expt. No.	Name of Experiment
1	Introduction to EDA Tool.
1	Plot the transfer characteristics of NMOS using EDA Tools.
2	Plot the transfer characteristics of PMOS transistor using EDA Tools.
3	Plot the transfer characteristics of CMOS Inverter using EDA Tools.
4	Gate Level Analysis of NAND Gate.
5	Gate Level Analysis of NOR Gate.
6	Gate Level Analysis of Transmission Gate.
7	Designing of low power D Flip-flop.
8	Designing of low power S-R Flip-flop.
9	Study of Combinational Circuit Design.
10	Study of Advanced Logic Families.

EE405 / EE715	Algorithm & Data Structures	L= 4	T = 0	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcome
➢ To verify the fundamental data structures and algorithms, to have good command of algorithmic techniques, their applications and complexity.	➢ Graduates will learn the basic concepts of Algorithms. ➢ Graduates will learn formation Data Structures. ➢ Graduates will learn Searching and Sorting Algorithms.
Mapped Program Outcomes: a,b,d,e,k	

UNIT-1:
Introduction to Algorithms, Basics of Algorithm, Sub Algorithms, Procedures and Functions, Analysis of Algorithms, Time and Space Complexity, Programming aspects with respect to structured programming, Top down and bottom Up Approach.

UNIT-2:
Arrays, Operations, Types, Representation of 1D, 2D arrays in memory, Sparse Matrices, Sorting, Quick Sort, Merge Sort, Insertion, Radix, Selection and Bubble Sort, Searching , Linear, Binary Search, Hashing and collision Handling mechanism.

UNIT-3 :
Stack , Fundamentals, Operations, Push , Pop , Applications of Stacks, Evaluation of Expressions, Recursion, Stack Machines and Multiple Stacks, Queues , Operations, Add , Delete, Types of Queues , Priority Queues, Circular Queue, Dequeue.

UNIT-4:
Fundamentals of singly, Doubly, Circular, Linked Stacks and Queues, Examples of Linked List, Circular Linked List, Doubly Linked List and Dynamic Storage Management, Garbage Collection, Compaction and Applications of Linked List, Operations of Polynomials, Generalized Linked List.

UNIT-5 :
Basic Terminology , Binary Tree Traversals, Threaded Storage Representation, Binary Search Tree, Applications of Tree, Preliminary Treatment of AVL Trees, B-Trees, B+ Trees, Heap Sort.

UNIT-6:
Basic Terminology, Graph Representation, Matrix, List, Multi-List, Graph Traversals, Breath First Search, Depth First Search, Minimum Cost Spanning Trees, Shortest Path Algorithm, Topological Sort, Critical Path.

Text books:				
1	Data Structures and Program Design in C	Second Edition	Kruse, Leung and Tondo	PHI
2	Fundamentals of Data Structures	Fifth Edition	Ellis Horowtiz and SartajSahani	Galgotia Publications,
Reference books:				
1	An Introduction to Data Structures with Applications	Second Edition	Tremblay & Sorenson	TMH
2	Data Structures, Schuam Series	Fifth Edition	Seymour Lipschutz, G.A. V. Pai	TMH

Chairperson		Date of Release	May 2013	Applicable for AY 2013-14 Onwards
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EE406 / EE716	Algorithm & Data Structure Laboratory	L = 0	T = 0	P = 2	Credits = 1

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	40	60	100	

Objective	Outcomes
➢ To verify the fundamental data structures and algorithms, to have good command of algorithmic techniques, their applications and complexity.	➢ Student will understand Algorithm and their Applications. ➢ Student will understand the use of Data Structures in Computer Programming. ➢ Student will get exposure to Practical Computer Programming Concept.
Mapped Program Outcomes: a,b,d,e,k	

Expt. No.	Name of Experiment
1	Write a program on control Structure & Statements
2	Write a program on If –else structure
3	Write a program on Case Statement
4	Write a program on Functions
5	Write a program on Macros
6	Write a program on Pointers
7	Write a program on Structures
8	Write a program on Linked List
9	Write a program on Doubly linked list
10	Write a program on graphs
11	Write a program on Trees
12	Write a program on Search Algorithms
13	Write a program on Stacks

EE407 / EE706	Electronics Circuit Design	L= 3	T = 1	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcomes
➢ This course deals with the various types of active filters, Amplifiers and their analysis. ➢ It also gives better understanding of the functions of operations and limitations of different Circuits.	➢ Students will acquire knowledge of Practical Circuit Design. ➢ Students will have a fair knowledge of Analysis of circuit Design. ➢ Students will understand the Power supplies and their design.
Mapped Program Outcomes: b,c,e,k,l,m	

UNIT-1:
Design of Filters: Filter Transmission Types and Specifications, The Filter Transfer Function, Butterworth and Chebyshev Filters, First Order and Second Order Filter Functions, The second Order LCR Resonator, Second order Active Filters Based on Inductor Replacement.

UNIT-2:
Design of Differential and Multistage Amplifiers: The BJT Differential Pair, Small Signal Operation of the BJT Differential Amplifier, Other Non-ideal characteristics of the differential amplifier, Biasing in BJT Integrated Circuits, The BJT Differential Amplifier with Active Load, MOS Differential Amplifiers, BiCMOS Amplifiers, Multistage Amplifier.

UNIT-3 :
Design of Tuned & Untuned Amplifiers: Tuned Amplifier Circuits, Inductor Losses, Use of Transformers, Amplifiers with Multiple Tuned Circuits , Synchronous Tuning, Classification of Amplifier, Distortion in Amplifiers, Frequency Response of Amplifier, RC Coupled Amplifiers, Low-Frequency Response of an RC-Coupled Stage, Cascaded Transistor CE Stage, Step Response of an Amplifier, Bandpass of Cascaded States, Effect of an Emitter bypass capacitor on low frequency response

UNIT-4:
Design of Power Amplifiers: Classification of Output Stage, Class A Output Stage, Class-B Output Stage, Class AB Output Stage, Biasing the Class AB Circuit, Class C Output Stage, Power BJTs, Variations on the Class AB Configuration, IC Power Amplifiers, Design of Heat Sinks for Power Amplifiers

UNIT-5 :
Design of Signal Generators and Wave Shaping Circuits: Basic Principle of Sinusoidal Oscillators, Op-Amp RC Oscillator Circuits, LC and Crystal Oscillators, Bistable Multivibrators, Generation of Square and Triangular Waveform using Astable Multivibrators, Generation of Standardized Pulse, The Monostable Multivibrator, Integrated Timer Circuits, Precision Rectifier Circuits

UNIT-6:
Design of Switch Mode Power Supplies: Introduction to switch mode power supplies ,comparison linear and switch mode power supplies, Analytical techniques, Buck converter, Boost Converter, Buck-Boost Converter

Text books:				
1	Microelectronics Circuits : Theory and Applications	Fifth Edition, 2010.	Adel S. Sedra and Kenneth C. Smith	Oxford University Press
2	Millman's Electronics Devices and Circuits	Second Edition,2008	Jacob Millman, Christos C. Halkias, SatyabrataJit	Tata McGraw Hill
3	Schaum's Outline of Electronics Devices and Circuits	2002	Jimmie Kathey	McGraw Hill
Reference books:				
1	Design with Operational Amplifiers and Analog Integrated Circuits	Third Edition, 2002	Sergio Franco	McGraw Hill
2	Electronics Devices and Circuits Theory	1999	NasheskyBoylestead	PHI

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Dean (Acad. Matters)		Version	1.00	

EE408 / EE707	Electronics Circuit Design Laboratory	L = 0	T = 0	P = 2	Credits = 1

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	40	60	100	

Objective	Outcomes
➢ This course deals with the various types of active filters, such as LP, HP, BP, BR, and notch filters, which is very useful in communications. It also gives better understanding of the functions of operations and limitations of different ICs and their remedies.	➢ Students will acquire knowledge of Practical Circuit Design. ➢ Students will have a fair knowledge of Analysis of circuit Design. ➢ Students will understand the Power supplies and their design.
Mapped Program Outcomes: b,c,e,k,l,m	

Expt. No.	Name of Experiment
1	Design of LPF (Butterworth Filter) First Order
2	Design of HPF (Butterworth Filter) Second Order
3	Design of Non-Ideal Differential Amplifier / Multistage
4	Design of Multistage RC Coupled Amplifiers
5	Design of Class B Amplifier(Symmetry)
6	Design of Triangular Wave Generator
7	Design of Precision Rectifier
8	Design of Step Down SMPS
9	Design of Step Up SMPS
10	Mini-project

EE409 / EE717	Digital Communication	L= 4	T = 0	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objectives	Outcomes
➢ This course provides compressive coverage of digital communication systems and understanding of the operation of digital modulation schemes/	➢ Graduates will learn pulse modulation & discuss the process of sampling, quantization & coding that is fundamental to the digital transmission of analog signals. ➢ It will provide fundamental concepts & limits in information theory in the context of digital communication theory/ ➢ Will able to analyze mathematical model of digital communication systems. ➢ Will able to apply error control coding techniques at the receiver.
Mapped Program Outcomes: b,c,e,l	

UNIT-1:
PCM, DM, ADM, DPCM, sub-band and transform coding, model based speech coding like LP coding, CELP coding.

UNIT-2:
Introduction to information theory, entropy, Huffman, Prefix code, and L-Z encoding algorithm, Rate distortion theory for optimum quantization.

UNIT-3 :
Gram-Schmitt procedure, Signal space representation of baseband and modulated signals, line coding and baseband digital transmission, Error probability and optimum receivers for AWGN channels, Matched filters.

UNIT-4:
Digital Modulation techniques, Transmitter, Receiver and signal space representation of BPSK, BFSK,QPSK, Introduction toTDM,FDM,OFDM.

UNIT-5 :
Channel capacity Review of channel coding, Linear block codes, cyclic codes, convolution, encoding and decoding, distance properties, Viterbi algorithm and Fano algorithm. Trellis coded modulation methods.

UNIT-6:
Study of PN sequences, direct sequence methods, Frequency hop methods, digital spread spectrum, slow and fast frequency hop, performance analysis, synchronization methods for spread spectrum. Application of spread spectrum, CDMA.

Text books:				
1	Digital communication	3rd Edition, 2004	John G Prokis	Springer publication
2	Digital communication	2nd Ed, 2002.	Simon Haykin	John Wiley & sons

Reference books:

1	Modern Communication systems (Principles and application)	6th Edition, 2002	Leon W. Couch	Pearson
2	Digital Communication	5th Edition, 2003.	ShanmughamK.Sam	John Wiely
3	Modern Digital & Analog Communication Systems	3rd Edition, 1999.	B.P.Lathi	Oxford university Press
4	Principles of Communication Systems	3rd Edition, 2007.	Taub Schilling	Tata McGraw Hill publication

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EE410 / EE718	Digital Communication Laboratory	L = 0	T = 0	P = 2	Credits = 1

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	40	60	100	

Objective	Outcome
➢ To analyze digital modulation techniques. ➢ To analyze keying techniques.	➢ Students will be able to demonstrate different modulation techniques and observe the behavior for the same.
Mapped Program Outcomes: b,c,e,l	

Expt. No.Name of Experiment

1.	To perform Pulse Code Modulation
2.	To perform Delta modulation.
3.	To perform Adaptive Delta modulation.
4.	To observe and perform u law and A low companding.
5.	To perform DPCM
6.	To observe and perform ASK,FSK,PSK modulation.
7.	To simulate BPSK transmitter and receiver
8.	To simulate QPSK transmitter and receiver
9.	To implement design for PN sequence generator.

EE411 / EE803	Fuzzy Logic & Neural Network	L= 4	T = 0	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objectives	Outcomes
➢ To make the students well acquainted with Soft computing techniques, especially Fuzzy logic, Neural networks and Genetic algorithm. ➢ To make the students able to identify the complex problems in conventional structures, obtain intelligent acceptable solutions for these problems using soft computing techniques and take the necessary corrective action in the light of ongoing events.	➢ Students are well acquainted with Soft computing techniques, especially Fuzzy logic, Neural networks and Genetic algorithm. ➢ Students are able to identify the complex problems in conventional structures especially in fields pattern recognition, communication engineering, and several control operations, obtain intelligent acceptable solutions for these problems using soft computing techniques. ➢ Students are able to handle uncertainty, unpredictability and vagueness in some of the concepts which are not covered by traditional science and technology by applying concepts of fuzzy logic. ➢ Students are able to introduce intelligence in conventional structure using neural networks. ➢ Students are able to search fast and arrive at some optimized solutions for some problems using concepts of Genetic algorithm. ➢ Students can take the necessary corrective action in the light of ongoing events.
Mapped outcomes: b,c,d,k	

UNIT-1:
Crisp sets: An overview, Fuzzy sets: Basic types, basic concepts, basic properties of α-cuts, representation of fuzzy sets, and extension principle of fuzzy sets
UNIT-2:
Operations on fuzzy sets, Fuzzy numbers, Arithmetic operations on intervals, arithmetic operations on fuzzy numbers, fuzzy equations
UNIT-3 :
Fuzzy controllers: an overview with applications, applications of fuzzy logic
UNIT-4:
Fundamental concepts of ANN: Basic building blocks of artificial neural networks, network architectures, activation functions, McCulloch-Pitt's neuron model, Learning rules: Hebbian learning rule, Perceptron learning rule, Delta learning (Widrow- Hoff and LMS)rule, Competitive learning rule, Boltzmann learning
UNIT-5
Brief introduction to single layer and multi layer perceptions, ADALINE and MADALINE, Feed forward networks, Back propagation networks and applications.:
UNIT-6:
Radial basis function network, Self organizing feature map and applications

Text books:				
1	Fuzzy sets and Fuzzy logic	2008	George J. Klir and Bo Yuan	Prentice Hall
2	Neural Networks: A comprehensive Foundation'	2nd Edition, 2005	Simon Haykin	Pearson publications
Reference books:				
1	Fuzzy sets: Uncertainty & information	1988	Klir and Folger	PHI
2	Introduction of Artificial Neural Networks	1999	Jacek Zurada	Pws Pub Co
3	Neural Network and Fuzzy Systems	1991	Bart Kosko	PHI
4	Neural network design	2004	Martin Hagan, Howard Demukh, Mark Beale	Thomson learning and Vikas publishing house

Chairperson		Date of Release	May 2013	Applicable for AY 2013-14 Onwards
Dean (Acad. Matters)		Version	1.00	

EE429/ EE825	Basics of Analog and Digital Communication Systems	L= 4	T = 0	P = 0	Credits =4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcome
➢ To Study of amplitude, frequency & phase modulation. ➢ To learn the concept of PPM, PAM, PWM & PCM & delta modulation. ➢ To understand the operation of digital modulation techniques.	➢ Recognize and utilize latest analogue and digital communication technologies. ➢ It will provide fundamental concepts & limits in information theory in the context of digital communication theory. ➢ Graduates will demonstrate different modulation techniques. ➢ Graduate will be able to explain digital modulation techniques for transmitting digital data. ➢ Graduates will be able to describe various types of transmitters & receivers in communication system.
Mapped outcomes: b,c,d,k	

UNIT-1:Basic block diagram of Analog communication system, Modulation techniques: Need for modulation, Basic concepts of AM, FM, PM, Transmitters.

UNIT-2:Receivers: Basic receiver (TRF), Super heterodyne receiver, AM detectors, FM Detectors, Noise Types of Noise, Definition of Noise figure, signal to noise ratio, calculation of noise figure.

UNIT-3Pulse Modulation: Generation and demodulation of PAM, PWM, PPM, Time division Multiplexing, Frequency division multiplexing.

UNIT-4Basic digital Modulation System, Channel capacity, PCM, ADPCM, Delta Modulation, ADM.

UNIT-5Digital Modulation techniques: ASK, FSK, PSK, BPSK,QPSK, MSK, DPSK, BFSK,

UNIT-6 Source coding and channel coding, Information theory, Huffman coding, LZ coding, Basic concept of convolution code.

Text books:				
1	Electronic Communication System	Fourth Edition, 1999	Gorge Kennedy	Tata McGraw-Hill
2	Digital Communications		Symon Hykin	Wiley, 1988
Reference books:				
1	Electronic Communication Systems	Second Edition, 1993	Frank R. Dungan	Delmar Publishers
2	Communication Electronics	Third Edition, 2007	Louis Frenzel	McGraw-Hill
3	Digital and analog communication systems	Fifth Edition,2003	K. Sam Shanmugam	John Wiley & Sons

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EE412 / EE810	Project phase 1	L = 0	T = 0	P = 4	Credits = 4

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	40	60	100	
Mapped outcomes: d,i,l,m,g,f,e				

EE413 / EE821	Industrial Training	L = 0	T = 0	P = 0	Credits = 2

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	100		100	
Mapped outcomes: f,g,d				

GE405/GE702	Engineering Management			L= 3	T=0	P=0	Credits=3
Evaluation Scheme	MSE-I	MSE-II	TA	ESE		Total	ESE Duration
	15	15	10	60		100	3 Hrs

Objective	Outcome
➢ This subject helps student to understand the Functions of management, Marketing Management, Personnel Management, Plant Management, Inventory Control and Finance Management in the organization.	➢ As a studying HR, it helps us to know administration of organization. ➢ It is more concerned with decision making to make the best under a given situations & to be ethically and socially responsive to the needs of society. ➢ It helps to formulating strategies to exploit rewarding opportunities thereby maximizing its return on investment. ➢ Students are expected to understand & demonstrate the effect of time value of money, depreciation & foreign currency, trade.
Mapped Program Outcomes: d,f,g,h,j	

UNIT-1: Principles of management
Concepts of management, development of scientific management, Taylor Principles Fayol, functions of management such as planning, decision making, organizing, communication, controlling, span of control.
[8Hours]

UNIT-2: Personnel & Human Resource Management
Concept and evolution of personnel management and HRM, Difference between PM and HRM. Functions of HRM Concept of HRD. HR Planning, Concept, Objective, Importance, and Process. Recruitment: Meaning, process, Recruitment Agencies, selection process, test, and types of test, interview and types of interview. Training and Development.
[7Hours]

UNIT-3 Project management
Types of projects, various phases of project, Project Proposal, Components of planning, Objectives of planning, Factors affecting planning, Organizational setup, Network techniques Introduction and Use of CPM &PERT for planning. Estimation of critical path and project duration. Resource planning, Resource Allocation, Resource leveling, Optimization of project cost, Cost slope concept.
[7Hours]

UNIT IV Marketing Management:-
Definition & scope, selling & modem concepts of marketing, market research, rural marketing, Customer Behaviors, marketing strategies, product launching, product life cycle, sales promotion, pricing, channels of distribution, Advertising, market segmentation, marketing mix, positioning, targeting
[8 Hours]

UNIT V Inventory Management :-
Principles of Inventory Management , Importance & objectives of Effective Inventory Management , Types of Inventory Control Systems, Inventory Control Procedures, Concept of ABC Analysis Benefits of ABC Analysis.
[7 Hours]

Chairperson		Date of Release	May 2013	Applicable for AY 2013-14 Onwards
Dean (Acad. Matters)		Version	1.00	

GE405/GE702	Engineering Management			L= 3	T=0	P=0	Credits=3
Evaluation Scheme	MSE-I	MSE-II	TA	ESE		Total	ESE Duration
	15	15	10	60		100	3 Hrs

UNIT VI Financial Management:-
Definition & Functions of Finance department, Sources of finance ,financing organizations, types of capital, elements of costs & allocations of indirect expenses, cost control, break even analysis, budgets & budgetary control, equipment replacement policy, make or buy analysis, balance sheet, ratio analysis, profit & loss statement. [8Hours]

TEXT BOOKS:
I) Principles of Management: Koontz & O Denial
2) Industrial Organization & Engineering Economics: T. R. Banga & S. C. Sharma
3) Financial Management – Kuchal
REFERENCES:
1) Principles of marketing management; Philip Kotler & William Stauton
2) Customer Behavior : Leon G. Schiffman, & Leslie Lazar Kanuk

EE414 / EE812	Computer Communication Network	L= 4	T = 0	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objectives:	Outcomes:
➢ To learn basics of data communication, wireless transmission, spread spectrum, medium access control- FDMA, TDMA & CDMA. ➢ To study TCP/IP, ARP, RARP, UDP protocols & addressing. ➢ To study network security & it applications.	➢ Will have understanding of reference mode for data communication & functions of all layers of OSI reference model. ➢ Will able to differentiate between various protocols of different layers & standards on data communication. ➢ Will acquire knowledge of the network layer routing protocols.
Mapped Program Outcomes: a,c,e	

UNIT-1:
Introduction, network and services: communication network, approaches to network design, types of network, two stage and three stage network. Uses of computer networks, LAN, MAN, WAN, design issues for layers, connection oriented and connectionless services, service primitives, Application and layered architecture, OSI reference model.

UNIT-2 :
LAN network and medium access layer: LAN structure, random access, multiple access protocols, IEEE standard 802 for LAN and MAN, high speed LANS, repeaters, hubs, bridges, fast Ethernet, Wireless LAN
UNIT-3 :
Physical layer and data link layer: transmission media, PSTN.
Data link layer design issues, error detection and correction methods, elementary data link protocols, sliding window protocols.

UNIT-4:
Network layer and transport layer: network layer design issues, routing, congestion, internetworking, transport layer design issues, transport service primitives, internet transport protocol, TCP/IP architecture, TCP/IP protocol, IP packets, IP addressing, TCP/IP utilities ,wireless TCP and UDP, routers and gateways

UNIT-5:
Application layer: network security cryptography, secrete key, public key, digital signature, domain name system, electronic mail system

UNIT-6: Multimedia, real time transport protocol, e-mail security, web security, communication security, electronic mail, world wide web.

Text books:				
1	Computer Networks	3rd Edition,1996	Tanenbaum	Prentice Hall
2	Data Communications and Networking	4th edition, 2007	Behrouz a Forouzan	Tata Mc. Graw Hill
eference books:				
1	Data and Computer Communication	8th Edition,2006	W. Stallings	Prentice Hall
2	Telecommunication switching systems and networks	2004.	T. Vishwanathan	Prentice Hall

Chairperson		Date of Release	May 2013	Applicable for AY 2013-14 Onwards
Dean (Acad. Matters)		Version	1.00	

EE415 / EE813	Operating Systems Concepts	L= 4	T = 0	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcome
➢ To have an overview of different types of operating systems. ➢ To know the components of an operating system. ➢ To have a thorough knowledge of process management. ➢ To have a thorough knowledge of storage management.	➢ Graduates will learn the basic concepts Operating System. ➢ Graduates will learn Processes , Threads, Memory Management. ➢ Graduates will also learn Security Issues in Operating System.
Mapped Program Outcomes: a, e, i, l	

UNIT-1:
Computer System organization ,Architecture, Structure, Operations, Process Management, Memory Management, OS Services, User Operating System Interface, System Calls, System Programs

UNIT-2:
Process Concept, Scheduling, Operations, Scheduling Criteria, Scheduling Algorithms, Tread Scheduling, Multiple Processor Scheduling

UNIT-3 :
Synchronization, Critical Section Problem, Semaphores, Deadlocks, System Models, Characterization, Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance

UNIT-4:
Memory Management Strategies, Swapping, Continuous Memory Allocation, Paging, Segmentation , Virtual Memory Management, Demand Paging, Page Replacement, Trashing,

UNIT-5 :
File System Concept, Access Methods, Directory and Disk Structure, Mounting, Sharing, Mass Storage Structure, Disk Attachment, Scheduling, RAID Structure

UNIT-6:
Protection and Security , Domain of Protection, Access Matrix, Access Control, Language based Protection, Security Problem, System and Network Threats, Cryptography as Security Tool

Text books:				
1	Operating System Concepts	Eigth Edition, 2012	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne	John Wiley & Sons (ASIA) Pvt. Ltd
2	Modern Operating Systems	2003.	Andrew S. Tanenbaum	Prentice Hall of India Pvt. Ltd
Reference books:				
1	Operating Systems	2002	Harvey M. Deitel	Pearson Education Pvt. Ltd
2	Operating System	4th Edition, 2003	William Stallings	Prentice Hall of India
3	An Introduction to Operating Systems, Concepts and Practice	2003	Pramod Chandra P. Bhatt	PHI,

Chairperson		Date of Release	May 2013	Applicable for AY 2013-14 Onwards
Dean (Acad. Matters)		Version	1.00	

EE416 / EE814	Biomedical Instrumentation	L= 4	T = 0	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcome
➢ This course is intended for exposing the students to basics of biomedical instrumentation. ➢ It also includes sections on microprocessors and signal acquisition systems as applied to medical instrumentation.	➢ Graduates will learn the basic concepts of biomedical instrumentation. ➢ Graduates will learn measurement techniques for involved in processes such cardiovascular measurements. ➢ Graduates will also learn techniques in x-rays, EMG, etc.
Mapped Program Outcomes: a, c, d, e, k	

UNIT-1:
Introduction to Biomedical instrumentation, development of biomedical instrumentation, biometrics, Physiological system of body, problems encountered in measuring a living system.

UNIT-2:
Basic transducer principle, active transducer, passive transducer, electrode theory, biopotential electrodes, biochemical transducers.

UNIT-3 :
The heart and cardiovascular system, characteristics of blood flow, blood pressure measurement, heart sound measurement. Principles of ultrasonic diagnosis, temperature measurement, electrocardiograph, plethysmography, pulmonary function measurement spirometry, pulmonary function analyzers, respiratory gas analyzers.

UNIT-4:
Generation of ionizing radiation, instrumentation for diagnostic X-ray, special technique, instrumentation for medical use of radioisotopes, radiation therapy, EMG.

UNIT-5 :
Patient care and monitoring, the elements of intensive care monitoring , diagnosis, calibration, reparability of patient monitoring equipment, instrumentation for monitoring patient, pacemakers, defibrillators.

UNIT-6:
Computers in biomedical instrumentation, digital computer, microprocessor, interfacing the computer with medical instrumentation and other equipments, electrical safety of medical equipment. Physiological effects of electrical current, shock hazards from electrical equipments, Methods of accident prevention.

Text books:				
1	Biomedical Instrumentation & Measurement	2nd Edition	By Leaslie Cromwell, Fred Weibell, Erich A Pfeiffer	PHI
Reference books:				
1	Handbook of Biomedical Instrumentation	2nd Edition	R.S.Khandpur	TMH
2	Bioelectronic Measurement	Jan 1983 edition	Dean A Dmane, David Michaels	PHI
3	Medicine and Clinical Engineering	2nd Edition	Jacobson and Webster	PHI
4	Introduction to Biomedical Equipment Design	4th Edition	Carr and Brown	John Wiley
5	Biomedical Digital Signal Processing	1993 Edition	Tompkins	PHI

Chairperson		Date of Release	May 2013	Applicable for AY 2013-14 Onwards
Dean (Acad. Matters)		Version	1.00	

EE417 / EE804	Soft Computing	L= 3	T = 1	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objectives	Outcomes
➢ To make the students well acquainted with Soft computing techniques, especially Fuzzy logic, Neural networks and Genetic algorithm. ➢ To make the students able to identify the complex problems in conventional structures, obtain intelligent acceptable solutions for these problems using soft computing techniques and take the necessary corrective action in the light of ongoing events.	➢ Students are well acquainted with Soft computing techniques, especially Fuzzy logic, Neural networks and Genetic algorithm. ➢ Students are able to identify the complex problems in conventional structures especially in fields pattern recognition, communication engineering, and several control operations, obtain intelligent acceptable solutions for these problems using soft computing techniques. ➢ Students are able to handle uncertainty, unpredictability and vagueness in some of the concepts which are not covered by traditional science and technology by applying concepts of fuzzy logic. ➢ Students are able to introduce intelligence in conventional structure using neural networks. ➢ Students are able to search fast and arrive at some optimized solutions for some problems using concepts of Genetic algorithm. ➢ Students can take the necessary corrective action in the light of ongoing events.
Mapped outcomes: b,d,e,k	

UNIT-1:
Overview of Crisp Sets, Concepts of Fuzzy sets, representation of fuzzy sets, extension principle, fuzzy compliments, t-norms and t- conorms.

UNIT-2:
Fuzzy numbers, arithmetic operation on intervals and on fuzzy sets, lattice of fuzzy numbers, fuzzy equations

UNIT-3 :
Fuzzy controllers, Defuzzification Methods, applications of fuzzy logic in pattern recognition and image processing,

UNIT-4:
Introduction of neural networks, learning methods, perceptrons, perceptron training algorithm, single layer perceptron, multiplayer perceptron, neural network architectures, ADALINE, MADALINE

UNIT-5 :
LMS algorithm, Back propagation algorithm, RBF networks, self-organizing feature maps, Applications of ANN

UNIT-6:
Introduction of Soft Computing Methods, Fundamentals of Genetic Algorithms, Encoding, Fitness function, Genetic modeling, Applications of GA.

Text books:				
1	Fuzzy sets and Fuzzy logic	2008	George J. Klir and Bo Yuan	Prentice Hall
2	Neural Networks, Fuzzy logic and Genetic Algorithms, Synthesis and applications		S. Rajsekharan, VijayalaxmiPai,	Prentice Hall
3	Neural Networks: A comprehensive Foundation'	2nd Edition, 2005	Simon Haykin	Pearson publications

Chairperson		Date of Release	May 2013	Applicable for AY 2013-14 Onwards
Dean (Acad. Matters)		Version	1.00	

EE417 / EE804	Soft Computing	L= 3	T = 1	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Reference books:				
1	Fuzzy sets: Uncertainty & information	1988	Klir and Folger	Prentice Hall
2	Introduction of Artificial Neural Networks	1999.	Jacek Zurada	Pws Pub Co
3	Principles of soft computing		S.N.Sivanandam, S.N.Deepa	Wiley India Ed.
4	Neural Network and Fuzzy Systems	1991	Bart Kosko	Prentice Hall
5	Neural network design	2004	Martin Hagan, Howard Demukh, Mark Beale	Thomson learning and Vikas publishing house

EE418 / EE805	Soft Computing Laboratory	L = 0	T = 0	P = 2	Credits = 1

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	40	60	100	

Objectives	Outcomes
➢ To make the students well acquainted with Soft computing techniques, especially Fuzzy logic, Neural networks and Genetic algorithm. ➢ To make the students able to identify the complex problems in conventional structures, obtain intelligent acceptable solutions for these problems using soft computing techniques and take the necessary corrective action in the light of ongoing events.	➢ Students are well acquainted with Soft computing techniques, especially Fuzzy logic, Neural networks and Genetic algorithm. ➢ Students are able to identify the complex problems in conventional structures especially in fields pattern recognition, communication engineering, and several control operations, obtain intelligent acceptable solutions for these problems using soft computing techniques. ➢ Students are able to handle uncertainty, unpredictability and vagueness in some of the concepts which are not covered by traditional science and technology by applying concepts of fuzzy logic. ➢ Students are able to introduce intelligence in conventional structure using neural networks. ➢ Students are able to search fast and arrive at some optimized solutions for some problems using concepts of Genetic algorithm. ➢ Students can take the necessary corrective action in the light of ongoing events.
Mapped outcomes: b,d,e,k	

Expt. No	Name Of Experiment
1	Design of Water level controller for a tank using Fuzzy logic.
2	Using Fuzzy Concepts, design temperature control in a shower
3	Use fuzzy concepts for adaptive noise cancellation.
4	Design of fuzzy inference engine
5	Design neural network for adaptive linear predictor
6	Design neural network for amplitude detector
7	Design neural network for cancer detector
8	Design neural network for crab classifier
9	GA based experiment to be added.
10	Self organizing Neural detector.
11	LVQ equalizer

EE419 / EE806	Analog VLSI Design		L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

OBJECTIVES	OUTCOMES
➢ To introduce the students to the fundamentals of CMOS circuits. ➢ To learn the modeling of circuits, circuit characterization and performance extraction. ➢ To understand basic electrical properties of MOS circuits and the design process at gate level and subsystem level. ➢ To give basic understanding of various analysis of differential amplifiers. ➢ To give basic understanding of non linear circuits such as comparator design.	➢ To learn the basics of MOS Circuits. ➢ To learn the various MOS Proces Technologies. ➢ Ability to design an electrical component system to meet desired needs. ➢ This course helps students in design ar analysis of analog circuits. ➢ To design and analysis of basic analo functional module designs such as curre mirrors, active load, biasing circuits. ➢ Understanding electrical Properties ar modeling of Very Large Scale Integrated Circui in order to design the large systems. ➢ Graduates will demonstrate the ability to desig a system, component or process as per need and specifications. ➢ Ability to simulate MOS devices and CMO circuits with SPICE: AC, DC, Transients.
Mapped Program Outcomes: b,c,l,m	

UNIT-1: SPICE Modeling of the MOSFET:
Depletion regions of a PN Junction, Basic principle of MOSFETs, Depletion and enhancement MOS Transistors, Review of MOS Transistor Theory, Introduction to large signal MOS models, Small Signal MOS Modeling, Square Law Equations, MOS Device Equations, MOSFET Noise Modeling.

UNIT-2:CMOS Technologies and Layouts:
CMOS technology, Analog MOS Process, N-Well Process, Twin Tub Process, CMOS Layout and Design Rules, Physical layout of Standard Gates, Latch-up considerations.

UNIT-3:Current Mirrors:
Current Source, Current Mirrors: Simple Bipolar current mirror, Simple MOS current mirror, I-V Characteristics of MOS Current Mirror, Cascode current mirrors, Widlar current mirror, Wilson Current mirror, Applications of Current Mirrors, Matching Currents.

UNIT-4 : MOS Transistor Amplifier:
Two Port Modeling, Single transistor Amplifiers stages: Common Drain, Common Gate & Common Source Amplifiers.
UNIT-5:Differential amplifiers:
Source Coupled Pair Differential Amplifiers, DC Transfer Characteristics, AC Operations, Transconductance, wide swing differential amplifiers, matching considerations.

UNIT-6: Nonlinear analog circuits:
Basic CMOS Comparator Design, Pre-amplification, Decision Circuit, Output Buffer, Characteristics: DC Characteristics, Transient Response, Propagation Delay, Minimum Input Slew Rate, Clocked Comparators.

Text books:				
1	CMOS circuit design, layout, and Simulation'	Second edition, reprint 2009.	Jacob Baker	WSE
2	Analysis and Design of Analog Integrated Circuits	fifth edition, reprint 2010	Paul B Gray , Hurst , Lewis, Meyer	John Wiley & sons

Chairperson		Date of Release	May 2013	Applicable for AY 2013-14 Onwards
Dean (Acad. Matters)		Version	1.00	

EE419 / EE806	Analog VLSI Design		L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Reference books:				
1	VLSI Design Techniques for Analog & Digital Circuits	1990	L Geiger, P E Allen and N R Strader	McGraw Hill
2	CMOS Analog Circuit Design	second edition, 2010	P.E.Allen, D.R.Holdberg	Oxford univ. press
3	Analog Integrated Circuit Design	1997	D. A. Johns and Martin	John Wiley,

EE420 / EE807	Analog VLSI Design Laboratory	L = 0	T = 0	P = 2	Credits = 1

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	40	60	100	

OBJECTIVES	OUTCOMES
➢ To introduce the students to the fundamentals of CMOS circuits. ➢ To learn the modeling of circuits, circuit characterization and performance extraction. ➢ To understand basic electrical properties of MOS circuits and the design process at gate level and subsystem level. ➢ To give basic understanding of various analyses of differential amplifiers. ➢ 5. To give basic understanding of non linear circuits such as comparator design.	➢ To learn the basics of MOS Circuits. ➢ Ability to simulate MOS devices and CMOS circuits with SPICE: AC, DC,Transients. ➢ To learn the various MOS Process Technologies. ➢ Ability to design an electrical component or system to meet desired needs. ➢ This course helps students in design and analysis of analog circuits. ➢ To design and analysis of basic analog functional module designs such as current mirrors, active load, biasing circuits. ➢ Graduates will demonstrate the ability to design a system, component or process as per needs and specifications.
Mapped Program Outcomes: b,c,l,m	

Expt. No.	Name of Experiment
1	NMOS characteristic :- VdsVs ID for various values of Vgs.
2	PMOS characteristic :- VdsVs ID for various values of Vgs.
3	Current source using current mirror :- DC analysis
4	Common Source amplifier:- AC analysisTransientanalysis
5	Common Drain amplifier:- AC analysisTransientanalysis
6	Differential Amplifier :- AC analysis Transfer curve (Vin VsVout, DC condition)
7	Op-Amp Design: AC analysis Transient analysis DC analysis
8	SPICE simulation of basic analog circuits, Analog Circuit simulation Verification of layouts.
9	Basic CMOS Comparator Design
10	Source Coupled Pair Differential Amplifier

EE421 / EE808	Optical communication	L= 3	T = 1	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcome
➢ This course will provide understanding for applying optical fiber technology to sophisticated modern telecommunication systems. ➢ To understand the fundamental behavior of the individual optical components, describes their interactions with other devices in an optical fiber. ➢ To measure & analyze different measurements, parameters & properties of optical fiber.	➢ Student will learn the basic elements of optical fiber. ➢ Student will understand the different kinds of losses, signal distortion in optical wave guides & other signal degradation factors. ➢ Student will able to classify various optical source materials, LED structures, LASER diodes. ➢ Student will learn the fiber optic receivers such as PIN, APD diodes, receiver operation & performance. ➢ Student will understand the operational principal of WDM, SONET, measurement of attenuation, dispersion, refractive index profile in optical fibers.
Mapped Program Outcomes: a, b, e, l	

UNIT-1: INTRODUCTION TO OPTICAL FIBERS
Evolution of fiber Optic system. Principle of optical communication-Attributes and structures of various fibers such as step index, graded index mode and multi mode fibers. Propagation in fibers-Ray mode, Numerical aperture and multipath dispersion in step index and graded index fibers structure.

UNIT-2:SIGNAL DEGRADATION IN OPTICAL FIBERS
Attenuation, Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Group Delay, Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers, Polarization Mode dispersion, Intermodal dispersion, Pulse Broadening in GI fibers, Mode Coupling, Design Optimization of SM fibers, RI profile and cut-off wavelength.

UNIT-3 : FIBER OPTICAL SOURCES
Direct and indirect Band gap materials, LED structures, Light source materials, Quantum efficiency and LED power, Modulation of a LED, Laser Diodes , Modes and Threshold condition, Rate equations, External Quantum efficiency, Resonant frequencies, Laser Diodes structures and radiation patterns, Single Mode lasers, Modulation of Laser Diodes, Temperature effects, Fabry Perot cavity Quantum laser

UNIT-4: FIBER OPTICAL RECEIVERS
PIN and APD diodes , Photo detector noise, SNR, Detector Response time, Avalanche Multiplication Noise ,Comparison of Photo detectors, Fundamental Receiver Operation, Error Sources, Receiver Configuration, Probability of Error, The Quantum Limit, Noise Effects on System Performance, Eye diagram.

UNIT-5 : DIGITAL TRANMISSION SYSTEM
Introduction of fibers cables, Fiber Splicing and connectors, Operational Principals of WDM, SONET, LAN 1000 baseSX, LX and Passive Components, Optical TDM.

UNIT-6:MEASUREMENT IN OPTICAL FIBERS
Attenuation, Time domain dispersion and Frequency domain dispersion, OTDR, NA measurement Refractive index profile and optical source characteristic measurements.

Text books:				
1	Optical Fiber Communication	3rd edition, 1999.	Gerd Keiser	McGraw-Hill Science/Engineering /Math
2	Optical Communication, Principles and Practice	2nd Edition,1994	J.Senior	Prentice Hall of India

Reference books:				
1	Optical Communication System	2001	J.Gower	Prentice Hall of India
2	Fiber-Optic Communication System	Third Edition, 2009.	GovindAgrawal	John Willy & Sons

Chairperson		Date of Release	May 2013	Applicable for AY 2013-14 Onwards
Dean (Acad. Matters)		Version	1.00	

EE422 / EE809	Optical Communication Laboratory	L = 0	T = 0	P = 2	Credits = 1

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	40	60	100	

OBJECTIVES

Objective	Outcome
➢ This course will provide understanding for applying optical fiber technology to sophisticated modern telecommunication systems. ➢ To understand the fundamental behavior of the individual optical components, describes their interactions with other devices in an optical fiber. ➢ To measure & analyze different measurements, parameters & properties of optical fiber.	➢ Student will learn the basic elements of optical fiber. ➢ Student will understand the different kinds of losses, signal distortion in optical wave guides & other signal degradation factors. ➢ Student will able to classify various optical source materials, LED structures, LASER diodes. ➢ Student will learn the fiber optic receivers such as PIN, APD diodes, receiver operation & performance. ➢ Student will understand the operational principal of WDM, SONET, measurement of attenuation, dispersion, refractive index profile in optical fibers.
Mapped Program Outcomes: a, b, e, l	

Expt. No.	Name of Experiment
1	Measurement of Numerical Aperture.
2	Analysis of losses in optical fiber.
3	Measurement of propagation loss & bending loss.
4	Analysis of characteristics of fiber optic LED's and Detectors.
5	Analysis of Frequency Division Multiplexing & De-multiplexing.
6	To verify and measure different parameters of LED & Laser source using optical spectrum analyzer.
7	To measure attenuation of a fiber of 1 km length using optical spectrum analyzer.
8	To verify optical spectrum analyzer & using it find the location of fault.
9	To plot frequency response of detector for different values of load resistance.
10	To measure numerical apertures of plastic fiber.

EE423 / EE815	Object Oriented Programming	L= 4	T = 0	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcome
➢ The course aims is to introduce the students to Object Oriented Programming Concepts. ➢ Demonstrate mastery of object oriented programming concepts: inheritance, polymorphism, and operator overloading. ➢ Demonstrate mastery of pointers, iterators, memory management including object creation and destruction.	➢ Graduates will learn the basic concepts of Object Oriented Programming. ➢ Graduates will learn Inheritance, Polymorphism, Overloading. ➢ Graduate will also learn to Files and Stream Operations.
Mapped Program Outcomes: a,b,d,e,k	

UNIT-1:
Principles of Object Oriented Programming (OOP), Software Evaluation, OOP Paradigm, Basic Concepts of OOP, Benefits of OOP, Application of OOP.

UNIT-2:
Introduction to C++, Tokens, Keywords, Identifiers, Variables, Operators, Manipulators, Expressions and Control Structures, Pointers, Functions, Function Prototyping Parameters Passing in Functions, Values Return by Functions, Inline Functions, Friend and Virtual Functions.

UNIT-3 :
Classes and Objects, Constructors and Destructors, Operator overloading, Type of Constructors, Function Overloading, Inheritance, Types of Inheritance Virtual Functions and Polymorphism.

UNIT-4:
Definition of a data structure, Primitive and Composite data types, Asympotic notations, Arrays, Operations of Arrays, Order lists, Stacks, Applications of Stack, Infix to Postfix Conversion, Recursion, Queues, Operations of Queues.

UNIT-5 :
Singly linked list, Operations, Doubly linked list, Operations, Trees and Graphs: Binary tree, Tree traversal; Graph, Definition, Types of Graphs, Traversal (BFS & DFS), Dijkstra`s algorithm

UNIT-6:
Files, classes for file stream operations, Opening, Closing and Processing files, End of file detection , File pointes, Updating a file , Error Handling during file operations, Command line arguments, Templates, Exception Handling.

Text books:				
1	Object Oriented programming with C++	4th Edition,2008	E. Balagurusamy	TMH
Reference books:				
1	Object Oriented Programming in Microsoft C++	Third Edition, 2003	Robert Lafore	Galgotia publication
2	Fundamental of data structure in C++	2002.	E. Horowitz and S.Shani	Galgotia Pub
3	Computer algorithms	1998.	Horowitz, S.Shani and S.Rajasekaran	Galgotia Pub Pvt Ltd

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EE424 / EE816	Object oriented programming Laboratory	L = 0	T = 0	P = 2	Credits = 1

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	40	60	100	

Objective	Outcomes
➢ The course aims is to introduce the students to Object Oriented Programming Concepts memory management including object creation and destruction, and parameter passing in C++ .	➢ Student will understand Algorithm and their Applications. ➢ Student will understand the use of Data Structures in Computer Programming. ➢ Student will get exposure to Practical Computer Programming Concept.
Mapped Program Outcomes: a,b,d,e,k	

Expt. No.	Name of Experiment
1	Write a function using variables as arguments to swap the values of a pair of integers.
2	Write a program to read the ballot & count the votes cast for each candidate using an array, variable count. In case, a number read is outside the range 1 to 5, the ballot should be considered as a ' spoilt ballot' and the program should also count the number of spoilt ballot.
3	Write a program to read a matrix of size m*n from the keyboard and display the same on the screen.
4	Write a macro that obtains the largest of three numbers.
5	As the practical 4, using inline function. Test the function using the main program.
6	Define a class to represent a bank account including the following members:- Data Members, Member function to display the name and balance.
7	Modify the class and the program of practical 6 for handling 10 customers.
8	Create 2 classes OM and DB which store the value of distance. DM store distances in meters and cm and DB in feet and inches. Write a program that can read values for the class objects and add 1 object OM with another object of DB. Use a friend function to carry out the addition operation the object that stores the results may be a DM object or a DB object, depending upon the units in which the results are require. The display should be in the format of feet and inches or meters and cms depending on the object on display.
9	Write a program for maintaining the inventory of books that are being sold at the shop the Design a system using a class called books with suitable member functions and constructors. Use new operator in constructor to allocate memory space require.
10	Define a class string that could work as a user defined string type include constructors that will enable us to create an .un-initialized string String s1; :/ string with length 0 And also to initialize an object with string constant at the time of creation like String s2("well done"); . Include a function that adds two strings to make a third string.
11	Create a class float that contains 2 float data member. Over load all the 4 arithmetic operators so that do operate on the objects of float.
12	Define 2 classes POLAR and RECTANGLE to represent points in the POLAR and RECTANGLE systems. Use conversion routines to convert from one system to the other.
13	Exercise on file handling

EE425 / EE817	Wireless Communication	L= 4	T = 0	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcome
➢ To develop a strong theoretical background involving the evolution and future of wireless communication systems. ➢ To develop a detailed technical knowledge of current practice in wireless systems and networks.	➢ The students undergoing this course will be able to know the evolution of mobile communication. ➢ Will be able to understand the need and different methods for enhancing the quality of communication. ➢ Will also develop a detailed technical knowledge of current practice in wireless systems and networks.
Mapped Program Outcomes: b, c, e, k	

UNIT-1:
Introduction to Wireless Communication Systems: Evolution of Mobile Radio Communications Mobile Radio Systems around the world. Examples of Wireless Communication Systems, Comparison of common wireless communication systems, trends of cellular radio and personal communications, Second generation (2G) cellular Networks, Third generation (3G) cellular Networks, wireless local loops and LMDS.
UNIT-2:
The Cellular Concept: Cellular telephone system, frequency reuse, channel assignment and handoff strategies, interference and system capacity, trunking and grade of service, improving capacity in cellular system.
UNIT-3 :
Mobile Radio Propagation- Large & Small Scale Path Loss & Fading: Introduction to Radio Wave Propagation, Reflection, Diffraction, Scattering Practical Link Budget Design Using Path Loss Models, Signal Penetration into Buildings, Ray Tracing & Site Specific Modeling. Small Scale Multipath Propagation, Small Scale Multipath Measurements, Parameters of Mobile Multipath Channels, Types Of Small Scale Fading, Rayleigh &Rician Distribution.
UNIT-4:
Equalization & Diversity: Fundamentals of equalization, space polarization, frequency and time diversity techniques, space diversity, polarization diversity, frequency and time diversity. RAKE Receiver.
UNIT-5 :
Wireless Systems and Standards: GSM- global system for mobile: services and features, GSM system architecture, GSM radio subsystem, GSM channel types, GSM frame structure, signal processing in GSM, introduction to CDMA digital cellular standard (IS-95).
UNIT-6:
Wireless Networking: Introduction to wireless networks, Differences Between Wireless & Fixed Telephone Networks, Development of wireless networks, Traffic routing in wireless networks, Wireless data services, Common channel signaling, Signaling System No. 7.An Example of SS7,SIP-Global Cellular Network Interoperability.

Text books:				
1	Wireless Communication – Principles and practice	2nd edition, 2002	T S. Rappaport	Prentice Hall PTR, upper saddle river, New Jersey
2	Mobile Communications – Design fundamentals	2nd edition, 1997	William C. Y. Lee	John Willey

Reference books:				
1	Wireless digital communication : modulation & spread spectrum applications	1995.	Kamilo Feher	Prentice Hall PTR; Har/Dis edition
2	Wireless and Cellular Communication	3rd Edition,2005	W .C .Y. Lee	McGraw Hill
3	The Mobile Radio Propagation channel	2nd Edition, 2000	J.D. Parson	John Willey

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EE426 / EE818	Wireless Communication Laboratory	L = 0	T = 0	P = 2	Credits = 1

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	40	60	100	

Objective	Outcome
➢ To develop an ability to implement different system and study their outcome. ➢ To develop a detailed technical knowledge of current practice in wireless systems and networks.	➢ The students undergoing this course will be able study the working of cellular system. ➢ Will be able to understand different methods for enhancing the quality of communication. ➢ Will be able to design a communication system.
Mapped Program Outcomes: b, c, e, k	

Expt. No	Name Of Experiment
1	To study the Block diagram and working principal of cellular phone.
2	To study the cellular system and to compute the reuse ratio for different cluster size and plot it against different values of N.
3	Plot Path loss curve with respect to distance for different values of path loss exponent between 2 to 6.
4	To study effects of Rayleigh fading.
5	Using above example compute the bit error rate of the system for different values of the signal-to-noise ratio.
6	To filter a signal using a fading channel.
7	To determine errors that occurs in trying to recover the modulated message with and without the equalizer.
8	To identify the time and frequency spreads of a channel.
9	Study of CDMA Architecture.
10	Study of GSM Architecture.

EE427 / EE819	Digital Image Processing	L= 4	T = 0	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcome
➢ The principal objective is to provide an introduction to basic concepts and methodologies for digital image processing, and to develop a foundation that can be used as the basis for further study and research in this field.	➢ Graduates will learn the basic concepts of image processing. ➢ Graduates will learn formation of digital image and concepts of digital geometry that help in understanding the image processing operations. ➢ Graduates will learn image enhancement techniques. ➢ Graduates will also learn image restoration, compression and storage techniques.
Mapped Program Outcomes: b,e,l,m	

UNIT-1:
Digital image fundamentals : Digital Image through scanner, digital camera, Concept of gray levels, Gray level to binary image conversion, Sampling and quantization, Relationship between pixel, Imaging Geometry.

UNIT-2:
Image Transforms: 2-D FFT, Properties, Walsh transform, Hadamard Transform, Discrete cosine Transform, Haar transform, Slant transform.

UNIT-3 :
Image enhancement : Point processing, Histogram processing, Two dimensional fourier transform, Spatial filtering and its frequency domain interpretation. Enhancement in frequency domain, Image smoothing, Image sharpening.

UNIT-4:
Image segmentation: Detection of discontinuities. Edge linking and boundary detection, Thresholding, Region oriented segmentation.

UNIT-5 :
Image Restoration: Degradation model, Algebraic approach to restoration, Inverse filtering, Least mean square filters, Constrained Least Squares Restoration, Interactive Restoration.

UNIT-6:
Image compression: Redundancies and their removal methods, Fidelity criteria, Image compression models, Source encoder and decoder, Error free compression, Lossy compression.

Text books:				
1	Digital Image processing	2nd Edition, 2002	R.C. Gonzalez & R.E. Woods	Wesley/ Pearson education
2	Fundamentals of Digital Image processing	1989.	A.K.Jain	PHI
Reference books:				
1	Digital Image processing using MAT LAB	2004	Rafael C. Gonzalez, Richard E Woods and Steven L.	PEA,
2	Digital Image Processing	3rd Edition,2004.	William K. Pratt	John Wilely
3	Fundamentals of Electronic Image Processing	SPIC/IEEE Series,1996	Arthur R. Weeks	PHI

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EE428 / EE820	Digital Image Processing Laboratory	L = 0	T = 0	P = 2	Credits = 1

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	40	60	100	

Objective	Outcome
➢ The principal objective is to provide an introduction to basic concepts and methodologies for digital image processing, and to develop a foundation that can be used as the basis for further study and research in this field.	➢ Graduates will learn formation of digital image and concepts of digital geometry that help in understanding the image processing operations. ➢ Graduates will learn image enhancement techniques. ➢ Graduates will also learn image restoration, compression and storage techniques.
Mapped Program Outcomes: b,e,l,m	

Expt. No	Name Of Experiment
1	To Explore statistical properties of Image & displaying histogram & profile.
2	Histogram modification
3	Image smoothing operations
4	Pseudo coloring of gay level images
5	Edge detection
6	Segmentation using threshold
7	Region based segmentation
8	Image Transforms
9	Image Compression
10	Image Segmentation

EE433 / EE811	Electronic Design Automation Laboratory	L = 0	T = 0	P = 2	Credits = 1

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	40	60	100	
Mapped Program Outcomes**:** c, d, e, f, j,l,m				

Expt. No.	Name of Experiment
1	Study of Device model using SPICE.
2	DC circuit analysis.
3	Transient analysis.
4	AC circuit analysis.
5	Analysis of Diode circuits.
6	Bipolar junction transistors.
7	Field effect transistors.
8	Op-Amp Circuits.
9	SMPS/SWITCHING CIRCUIT.

Text books:				
1	Introduction to PSpice using OrCAD for circuits and Electronics	Third edition, 2003.	Muhammad H.Rashid	Prentice Hall

Reference Website:	
1	http://bwrc.eecs.berkeley.edu/classes/icbook/spice/

EE430 / EE822	Comprehensive Viva-voce	L = 0	T = 0	P = 0	Credits =2

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	40	60	100	
Mapped outcomes: d,i,l,m,g,f,e				

EE431 / EE823	Extra Curricular / Competitive Exam	L = 0	T = 0	P = 0	Credits = 2

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	100		100	
Mapped outcomes: i,f,g				

EE432 / EE824	Project Phase 2	L = 0	T = 0	P = 6	Credits = 6

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	40	60	100	
Mapped outcomes: d,i,l,m,g,f,e				