SCHOOL OF ENGINEERING AND TECHNOLOGY
SRI PADMAVATHI MAHILA VISVAVISYALAYAM
SCHEME OF INSTRUCTION AND EVALUATION OF M.TECH(ECE)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
I YEAR – I SEMESTER (2019-20)

THEORY

S.No	Course Code	Course Title	Hours per Week			Credits	Evaluation					Total Marks
							Internal (30 Marks)			External (70 Marks)		
							Assignment	Test				
			L	T	P		Max. Marks	Duration (Hrs)	Max. Marks	Duration (Hrs)	Max. Marks	
1	19MECT01	CMOS VLSI Design	3	0	0	3	5	2	25	3	70	100
2	19MECT02	Advanced Digital Signal Processing and Algorithms	3	0	0	3	5	2	25	3	70	100
3		Program Elective-I	3	0	0	3	5	2	25	3	70	100
4		Program Elective-II	3	0	0	3	5	2	25	3	70	100
5	19MBST01	Research Methodology and IPR	2	0	0	2	5	2	25	3	70	100

PRACTICALS

S.No	Course Code	Course Title	Hours per Week			Credits	Evaluation					Total Marks
							Internal(40 Marks)			External (60 Marks)		
							Continuous Evaluation	Test				
			L	T	P		Max. Marks	Duration (Hrs)	Max. Marks	Duration (Hrs)	Max. Marks	
6	19MECP01	VLSI Lab	0	0	4	2	20	2	20	3	60	100
7	19MECP02	Signal Processing Lab	0	0	4	2	20	2	20	3	60	100
		Total	**14**	**0**	**8**	**18**						**700**

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I YEAR – II SEMESTER (2019-20)

THEORY

S.No	Course Code	Course Title	Hours per Week			Credits	Evaluation					Total Marks
							Internal (30 Marks)			External (70 Marks)		
							Assignment	Test				
			L	T	P		Max. Marks	Duration (Hrs)	Max. Marks	Duration (Hrs)	Max. Marks	
1	19MECT09	FPGA Architecture and Applications	3	0	0	3	5	2	25	3	70	100
2	19MECT10	Wireless Communications and Networks	3	0	0	3	5	2	25	3	70	100
3		Program Elective-III	3	0	0	3	5	2	25	3	70	100
4		Program Elective-IV	3	0	0	3	5	2	25	3	70	100

PRACTICALS

S.No	Course Code	Course Title	Hours per Week			Credits	Evaluation					Total Marks
							Internal(40 Marks)			External (60 Marks)		
							Continuous Evaluation	Test				
			L	T	P		Max. Marks	Duration (Hrs)	Max. Marks	Duration (Hrs)	Max. Marks	
5	19MECP03	Wireless Communications Lab	0	0	4	2	20	2	20	3	60	100
6	19MECP04	FPGA Lab	0	0	4	2	20	2	20	3	60	100
7	19MECS01	Term Paper cum Seminar	0	0	4	2	40	0	0	0	60	100
		Total	**12**	**0**	**12**	**18**						**700**

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II YEAR – I SEMESTER (2019-20)

THEORY

S.No	Course Code	Course Title	Hours per Week			Credits	Evaluation					Total Marks
							Internal (30 Marks)			External (70 Marks)		
							Assignment	Test				
			L	T	P		Max. Marks	Duration (Hrs)	Max. Marks	Duration (Hrs)	Max. Marks	
1		Program Elective-V	3	0	0	3	5	2	25	3	70	100
2		Open Elective	3	0	0	3	5	2	25	3	70	100

PRACTICALS

S.No	Course Code	Course Title	Hours per Week			Credits	Evaluation					Total Marks
							Internal(40 Marks)			External (60 Marks)		
							Continuous Evaluation	Test				
			L	T	P		Max. Marks	Duration (Hrs)	Max. Marks	Duration (Hrs)	Max. Marks	
3	19MECV01	Comprehensive Viva	0	0	0	2	40	0	0	0	60	100
4	19MECJ01	Project Work Phase-I	0	0	20	10	40	0	0	0	60	100
		Total	**6**	**0**	**20**	**18**						**400**

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
II YEAR – II SEMESTER (2019-20)

PRACTICALS												
S.No	**Course Code**	**Course Title**	**Hours per Week**			**Credits**	**Evaluation**					**Total Marks**
							Internal(40 Marks)			**External (60 Marks)**		
							Continuous Evaluation	**Test**				
			L	**T**	**P**		**Max. Marks**	**Duration (Hrs)**	**Max. Marks**	**Duration (Hrs)**	**Max. Marks**	
1	19MECJ02	Project Work Phase-II	0	0	32	16	40	0	0	0	60	100
		Total	**0**	**0**	**32**	**16**						**100**

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LIST OF ELECTIVES (2019-20)

ELECTIVE – I

S. No.	Course Code	Course Title
1	19MECT03	Embedded Systems
2	19MCST07	Wireless Sensor Networks
3	19MECT05	Advanced Digital Systems Design

ELECTIVE – II

S. No.	Course Code	Course Title
1	19MECT06	Optical Communications and Networks
2	19MECT07	Coding Theory and Techniques
3	19MECT08	Detection and Estimation Theory

ELECTIVE – III

S.No.	Course Code	Course Title
1	19MECT11	Low Power VLSI Design
2	19MECT12	Design for Testability
3	19MECT13	System on-chip Design

ELECTIVE – IV

S. No.	Course Code	Course Title
1	19MECT04	Digital Image And Video Processing
2	19MECT15	MIMO Systems
3	19MECT16	Adaptive Signal Processing

ELECTIVE – V

S. No.	Course Code	Course Title
1	19MECT17	Audio & Speech Processing
2	19MEET17	Neural Networks & Fuzzy Logic
3	19MCST10	Internet of Things

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LIST OF OPEN ELECTIVES OFFERED BY ECE TO OTHER DEPARTMENTS(2019-20)

S. No	Course Code	Course Title
1	19MECT22	Advanced Embed System

LIST OF OPEN ELECTIVES OFFERED BY OTHER DEPARTMENTS TO CSE (2019-20)

S. No	Course Code	Course Title	Offering Department
1	19MMET22	Advanced Operations Research	MECH
2	19MBST03	Business Analytics	BS&H
3	19MCST18	Information Retrieval System	CSE
4	19MBST02	English for Research Writing	BS&H
5	19MEET19	Solar Energy Utilisation	EEE

Ms. M. Krupa Swaroopa Rani
Coordinator (ECE)

Dr. P. Satyanarayana
BoS Chairman (I/C) (ECE)

Dr. R.V. Satyanarayana
BoS Chairman (ECE)

Dr. A. Ramakrishna Rao
Director, SE&T

19MECT01: CMOS VLSI DESIGN

Credits - 3 **Sessional Marks: 30**
L: T: P: 3:0:0 **University Exam Marks: 70**

Course Objectives

1.Basic characteristics of MOS transistor and examines various possibilities for configuring inverter circuits and aspects of latch-up are considered.
2.Design processes are aided by simple concepts such as stick and symbolic diagrams but the key element is a set of design rules, which are explained clearly.
3.The concepts of Semiconductor Memories, Flash Memory and RAM array organization.
4.To learn about Design of CMOS Op Amps, Compensation of Op Amps, Design of Two-Stage Op Amps, Power Supply Rejection Ratio of Two-Stage Op Amps, Cascade Op Amps, Measurement Techniques of OP Amp.
5.To teach basics for the design of high performance digital integrated circuits.

Course Outcomes

CO1.Understand the properties of MOS active devices and simple circuits configured when using them and the reason for such encumbrances as ratio rules by which circuits can be interconnected in silicon.
CO2.Know three sets of design rules with which nMOS and CMOS designs may be fabricated.
CO3.Solve engineering problems for feasible and optimal solutions in the core area of digital ICs.
CO4.Analyse complex engineering problems critically in the domain of analog IC design for conducting research.
CO5.Demonstrate advanced knowledge in Static and dynamic characteristics of CMOS, Alternative CMOS Logics.

UNITI

Review of Microelectronics and Introduction to MOS Technologies MOS, CMOS, BiCMOS Technology. Basic Electrical Properties of MOS, CMOS &BiCMOS Circuits: Ids – Vds relationships, Threshold Voltage VT, Gm, Gds and ωo, Pass Transistor, MOS, CMOS & Bi CMOS Inverters, Zpu/Zpd, MOS Transistor circuit model, Latch-up in CMOS circuits.

UNIT II

Layout Design and Tools Scalable Design rules, Layout Design tools. Logic Gates & Layouts: Static Complementary Gates, Switch Logic, Alternative Gate circuits, Low power gates.

UNIT III

Combinational Logic Networks Layouts, Simulation, Network delay, Interconnect design, Power optimization, Switch logic networks, Gate and Network testing.
Sequential Systems: Memory cells and Arrays, Clocking discipline, Power optimization, Design validation and testing.

UNIT IV

Analog CMOS Design Operational amplifiers: One stage OPAMP,Two stage OPAMP,Gain boosting, commonmode feedback, Slew rate, PSRR, Compensation of 2 stage OPAMP,Other compensationtechniques.

UNIT V

Floor Planning Floor planning methods, Global Interconnect, Floor Plan Design, Off-chip connections. Advanced technologies: Short channel effects, High–k, Metal Gate Technology, FinFET, TFET etc.

Text Books

Ms. M. Krupa Swaroopa Rani	Dr. P. Satyanarayana	Dr. R.V. Satyanarayana	Dr. A. Ramakrishna Rao
Coordinator (ECE)	BoS Chairman (I/C) (ECE)	BoS Chairman (ECE)	Director, SE&T

1. Essentials of VLSI Circuits and Systems, K. EshraghianEshraghian. D, A. Pucknell, 2005, PHI.
2. Modern VLSI Design – Wayne Wolf, 3rd Ed., 1997, Pearson Education.

Reference Books

1. J P Rabaey, A P Chandrakasan, B Nikolic, "Digital Integrated circuits: A design perspective", Prentice Hall electronics and VLSI series, 2nd Edition.
2. BehzadRazavi , "Design of Analog CMOS Integrated Circuits", TMH, 2007.
3. Kang, S. and Leblebici, Y., "CMOS Digital Integrated Circuits, Analysis and Design",TMH, 3rdEdition.

Course Outcomes-Program Outcomes -Program Specific Outcomes(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	M	H					H		
CO2	L	H	M				H	M	
CO3		H	M				M	H	L
CO4			L	M	H	H	H	M	
CO5	M	H						M	H

Ms. M. Krupa Swaroopa Rani
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BoS Chairman (ECE)

Director, SE&T

19MECT02: ADVANCED DIGITAL SIGNAL PROCESSING AND ALGORITHMS

Credits - 3 **Sessional Marks: 30**
L: T: P: 3:0:0 **University Exam Marks: 70**

Course Objectives

1.The objective is to learn DSP Architecture, digital filters, power estimation technique in DSP, advanced architectures and processor of DSP.
2.To give an exposure to the various fixed point & a floating point DSP architectures and to develop applications using these processors.
3.To give students practice in applying DSP theory to real-world situations, and DSP programming

Course Outcomes

CO1. Analyze and process signals in the discrete domain
CO2. Design filters to suit specific requirements for specific applications
CO3. Perform statistical analysis and inferences on various types of signals
CO4. Design multi rate signal processing of signals through systems, Compile and solve the digital signal processing problems using MATLAB.
CO5. Analyze binary fixed point and floating-point representation of numbers and arithmetic operations

UNIT I

Lti Discrete-Time Systems In The Transform Domain Types of Linear-Phase transfer functions, Simple digital filters, Complementary Transfer Functions, Inverse Systems, System identification, Digital Two-Pairs, Algebraic Stability Test.

UNIT II

Digital Filter Structure And Design All pass filters, Tunable IIR Digital filter, IIR tapped Cascaded Lattice Structures, FIR Cascaded lattice Structures, Parallel All pass realization of IIR Transfer Functions, State Space Structures, Polyphase Structures, Digital Sine-Cosine generator, Computational Complexity of Digital filter Structures, Design of IIR filter using pade' approximation, Least square design methods, Design of computationally Efficient FIR Filters.

UNIT III

DSP Algorithms Fast DFT algorithms based on Index mapping, Sliding Discrete Fourier transform, DFT Computation Over a narrow Frequency Band, Split Radix FFT, Linear filtering approach to Computation of DFT using Chirp Z-Transform.

UNIT IV

Analysis Of Finite Word Length Effects The Quantization Process and errors, Quantization of fixed-point Numbers, Analysis of Coefficient quantization effects, A/D conversion Noise Analysis, Analysis of Arithmetic Round of errors, Dynamic range scaling, Signal to Noise ratio in Low-order IIR Filters, Low sensitivity Digital filters, Reduction of Product Round off Errors using error feedback, Limit cycle in IIR Digital filters, Round of errors in FFT algorithms.

UNIT V

Applications Of Digital Signal Processing Dual Tone Multi-frequency Signal Detection, Spectral Analysis of Sinusoidal Signals, Spectral Analysis of Nonstationary Signals, Musical Sound Processing, Over Sampling A/D Converter, Over Sampling D/A Converter, Discrete –Time Analytic Signal generation.

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Textbooks

1. Digital Signal Processing by Sanjit K Mitra, Tata MCgraw Hill Publications.

References

2. Digital Signal Processing Principles, Algorithms,Applications By J G Proakis, D G Manolokis,PHI.
3. Discrete-Time Signal Processing by A V Oppenhiem, R W Schafer , Pearson Education Asia.

Course Outcomes-Program Outcomes -Program Specific Outcomes- (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	H	M	H	L			H	M	
CO2	H	M	M	L			M	H	
CO3	M	H					M	L	H
CO4	H	M				L		L	M
CO5	M	H	M				H	M	

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19MECT03: EMBEDDED SYSTEMS

Credits - 3 **Sessional Marks: 30**
L: T: P: 3:0:0 **University Exam Marks: 70**

Course Objectives

Students completing this course will be well positioned to
1.Familiarize about the basic functions of embedded systems.
2.Inculcate the basic architecture of general-purpose processors and its applications.
3.Gain interface between analog and digital blocks, also Software aspects of embedded systems.
4.Develop different State Machine and Concurrent Process Models.
5.Learn Evolution of complication and synthesis, Verification and reuse of intellectual property cores.

Course Outcomes

At the end of this course students will demonstrate the ability to
CO1. To understand the embedded system concepts and technologies of embedded systems.
CO2. To analyze the general process of embedded system development.
CO3. To apply Interfacing between analog and digital blocks and apply Software aspects of embedded systems.
CO4. To create finite state machines and analyze Communication and Synchronization among processes.
CO5.To remember evolution and verification of hardware/software co-simulation.

UNIT I

Introduction The concept of embedded systems design, Examples of embedded systems Design challenge, Processor technology, IC technology, Design technology. RT-Level combinational logic, Sequential logic (RT-Level), Custom single purpose processor design (RT-Level), Optimizing custom single purpose processors.

UNIT II

General Purpose Processors Basic architecture, Development environment, Application specific system depth, Set processors (ASIPs). Embedded Memories,

UNIT III

Technological aspects of embedded systems Interfacing between analog and digital blocks, signal conditioning, digital signal processing. system interfacing, interfacing with external systems, user interfacing. Design tradeoffs due to process compatibility, thermal considerations, etc., Software aspects of embedded systems: real time programming languages and operating systems for embedded systems.

UNIT IV

State Machine and Concurrent Process Models Introduction, Models Vs languages, Finite State Machine with Data path model (FSMD), Using State Machines, Program State Machine (PSM),Concurrent Process Model, Concurrent Processes, Communication among processors, Synchronization among processes, Implementation, Data flow model.

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UNIT V

Introduction Automation The parallel evolution of complication and synthesis, Logic, RT, Behavioral synthesis, System synthesis and hardware/software code sign, Verification of hardware/software co-simulation, Reuse of intellectual property cores, Embedded microcontroller cores.

Text Books

1.Embedded Systems Design – A unified Hardware/Software introduction by Frank Vahid, Tony D. Givargis, John Wiley & Sons. Inc. 2002.
2.J.W. Valvano, "Embedded Microcomputer System: Real Time Interfacing", Brooks/Cole, 2000.

Reference books

1. Jack Ganssle, "The Art of Designing Embedded Systems", Newness, 1999.
2. V.K. Madisetti, "VLSI Digital Signal Processing", IEEE Press (NY, USA), 1995.
3. David Simon, "An Embedded Software Primer", Addison Wesley, 2000.

Course Outcomes-Program Outcomes -Program Specific Outcomes -(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	H		L				H		
CO2	L	M	H	M	L			M	H
CO3				M	H		L	M	H
CO4		L	M	H				L	H
CO5			M	L		H	L	H	M

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19MCST07: WIRELESS SENSOR NETWORKS

Credits – 3 | **Sessional Marks: 30**
L:T:P::3:0:0 | **University Exam Marks: 70**

Course Objectives

To expose the students to the following:

1. Basics of wireless sensor networks and various sensor network architecture
2. Different types of Sensors and Sensing Techniques.
3. MAC protocols and Case studies.
4. Knowledge on Routing protocols of Sensor Networks
5. Security issues.

Course Outcomes

After successful completion of course the student should be able to

CO1. Understand fundamental concepts in the area of Wireless Sensor Networks.
CO2. Determine knowledge in applications of Wireless Sensor Networks.
CO3. Illustrate the MAC Protocols for Wireless Sensor Networks and case study.
CO4. Analyze the concept of Routing techniques
CO5. Identify the Security challenges and issues in sensor networks.

Unit I

Introduction to Wireless Sensor Networks: Motivations, Applications, History and Design factors, Performance Metrics, Anatomy of Sensor Node
Sensor Network Architecture: Layered, Clustered, OSI Based, Cross Layer Architecture.

Unit II

Sensing Techniques: Types of Sensors, Sensing Coverage, High-Level Sensors, Human as a Sensor, Actuators, sensor calibration, Detecting Errors
Designing and Deploying WSN Applications: Early WSN Deployments, General Problems, General Testing & Validation, Requirements Analysis, Top-Down Design Process, Bottom-up Implementation Process.

Unit III

Medium Access Control Protocols for WSN: Introduction, Fundamentals, Performance Requirements,Schedule-Based Protocols, Random Access-Based Protocols, Sensor-MAC Case Study.

Unit IV

Scheduling and Data Management: Survey on Data Routing in Wireless Sensor Networks, Data Centric Protocols: SPIN, Directed Diffusion, REAR, Rumor Routing
Hierarchical Routing: LEACH, Energy Efficient Weight-Clustering Algorithm in WSN, Self-Organizing Protocol
Location-Based Protocols, QoS-Aware Protocols: SPEED, MSPEED, Real-Time Power-Aware Routing.

Unit V

Security: Fundamentals of Network Security, Challenges of Security in Wireless Sensor Networks, Security Attacks in Sensor Networks, Protocols and Mechanisms for Security, IEEE 802.15.4 and ZigBee Security.

Text Book

1. Anna Forster," Introduction to Wireless Sensor Networks", Wiley-IEEE Press,2016

Reference Books

1. KazemSohraby, Daniel Minoli and TaiebZnati, "Wireless Sensor Networks:Technology, Protocols, and Applications", John Wiley & Sons, Inc., 2007.
2. Takahiro Hara,Vladimir I. Zadorozhny, and Erik Buchmann, "Wireless Sensor Network Technologies for the Information Explosion Era", springer 2010.

3. W. Dargie and C. Poellabauer, "Fundamentals of Wireless Sensor Networks –Theory and Practice", John Wiley & Sons, Inc., 2010.

19MECT05: ADVANCED DIGITAL SYSTEM DESIGN

Credits - 3 **Sessional Marks: 30**

L: T: P: 3:0:0 **University Exam Marks: 70**

Course Objectives

The objectives of this course is to make the students

1.To design and analyze various combinational circuit, sequential circuit mealy, moore machines.

2.To understand the concepts of VHDL for constructing the code for any type of Hardware & Implementation.

3.Able to create SM charts.

4.Study the behavior of CPLD's, FPGA and ASIC's.

5.Design different Digital circuits

Course Outcomes

At the end of the course the students will able to

CO1.Design Flipflops derived from other flipflops and reduce the state tables.

CO2.Synthesize and simulate all the VHDL constructs.

CO3.To Operate on PLD devices like CPLD, FPGA etc.

CO4.To realize SM charts and microprogramming.

CO5.To implement different application of PLD devices.

UNIT I

Review of Logic Design Fundamentals: Combinational Logic, Boolean Algebra and Algebraic Simplification Karnaugh Maps , Designing with NAND and NOR Gates , Hazards in Combinational Circuits , Flip-Flops and Latches , Mealy Sequential Circuit Design , Design of a Moore Sequential Circuit , Equivalent States and Reduction of State Tables , Sequential Circuit Timing , Tristate Logic and Busses

UNIT II

Introduction to VHDL: Computer-Aided Design , Hardware Description Languages , VHDL Description of Combinational Circuits , VHDL Modules , Sequential Statements and VHDL Processes , Modeling Flip-Flops Using VHDL Processes , Processes Using Wait Statements , **Types of VHDL Delays:** Transport and Inertial Delays ,Compilation, Simulation, and Synthesis of VHDL Code , VHDL Data Types and Operators , Simple Synthesis Examples , VHDL Models for Multiplexers , VHDL Libraries , Modeling Registers and Counters Using VHDL Processes , Behavioral and Structural VHDL , Variables, Signals, and Constants , Arrays , Loops in VHDL , Assert and Report Statements

UNIT III

Introduction to Programmable Logic Devices: Brief Overview of Programmable Logic Devices , Simple Programmable Logic Devices (SPLDs) , Complex Programmable Logic Devices (CPLDs) , Field-Programmable Gate Arrays (FPGAs) Design Examples: BCD to 7-Segment Display Decoder , A BCD Adder , 32-Bit Adders , Traffic Light Controller , State Graphs for Control Circuits , Scoreboard and Controller , Synchronization and Debouncing , A Shift-and-Add Multiplier , Array Multiplier , A Signed Integer,Fraction Multiplier , Keypad Scanner , Binary Dividers

UNIT IV

SM Charts and Microprogramming: State Machine Charts, Derivation of SM Charts, realization of SM Charts , Implementation of the Dice Game , Microprogramming , Linked State Machines

UNIT V

Designing with Field Programmable Gate Arrays: Implementing Functions in FPGAs ,Implementing Functions Using Shannon's Decomposition , Carry Chains in FPGAs , Cascade Chains in FPGAs , Examples of Logic Blocks in Commercial FPGAs , Dedicated Memory in FPGAs , Dedicated Multipliers in FPGAs , Cost of Programmability , FPGAs and One-Hot State Assignment , **FPGA Capacity:** Maximum Gates Versus Usable Gates , Design Translation (Synthesis) , Mapping, Placement, and Routing

Text Books

1. Charles Roth, LizyKurian John, Principles of Digital System Design using VHDL, Cengage Learning, 2009.

Reference Books

1. John F. Wakerly, Digital Design Principles and Practices, Pearson Education, 2002..
2. Digital Systems Design using VHDL by Charles Roth, Cengage Learning, 1998.
3. Michael Ciletti, Advanced Digital Design using Verilog HDL, Prentice Hall Publications, 2006
4. P.K.Chan& S. Mourad, Digital Design Using Field Programmable Gate Array, Prentice Hall (Pte) 1994.
5. S.Trimberger, Field Programmable Gate Array Technology, Kluwer Academic Publications ,1994.
6. J. Old Field, R.Dorf, Field Programmable Gate Arrays, John Wiley & Sons, Newyork, 1995

Course outcomes-Program outcomes -Program Specific Outcomes(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1		L	H			M	L	H	L
CO2	L			H	M		L	L	H
CO3		L		M	H		H	L	
CO4		M	L			H	L		H
CO5		M	L					H	L

Ms. M. Krupa Swaroopa Rani Dr. P. SatyanarayanaDr. R.V. Satyanarayana D r. A. Ramakrishna Ra
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19MECT06: OPTICAL COMMUNICATIONS AND NETWORKS

Credits - 3 **Sessional Marks: 30**

L: T: P: 3:0:0 **University Exam Marks: 70**

Course Objectives

The objectives of this course is to make the students

1.To learn the basic elements of optical fibre transmission link, fiberglass modes configuration s and structures.

2.To understand different kinds of losses, signal attenuation in optical fibres& other dispersion factor.

3.To learn various optical sources, LED/LASER structures, receivers (PIN, APD), and noise performance.

4.Understanding of optical network system components, variety of networking aspects, SONET/SDH.

5.Study of network operations, OTDM, OTDN etc. Link budget & network design and management.

Course Outcomes

At the end of the course the students will able to

CO1.Apply the fundamental principles of optics and light wave to design optical fiber communication systems.

CO2.Analyze losses in optical fiber link and state transmission characteristics of optical fiber.

CO3.Knowledge on optical fiber communication links using appropriate optical fibers light sources, detectors.

CO4.Apply concept of designing and operating principles of modern optical systems and networks.

CO5. Apply different network access schemes and packet switching in OFC systems.

CO6.Create and manage networks with appropriate consideration.

UNIT I

Introduction to Optic Communication Evolution of fiber types, guiding properties of fibers, cross talk between fibers, coupled modes and mode mixing, dispersion properties of fibers. **Optical and Mechanical Characterization of Fibers, Optical Cable Design**Design objectives and cable structures, fiber splicing, fiber end preparation, single and array splices, measurement of splicing efficiency, optical fiber connectors, connector alignments, optical sources for communication, LED, injection lasers, modulation technique, direct and indirect methods, optical waveguide devices

UNIT II

Optical Detectors Photodiodes in repeaters, receiver design, digital and analog, transmission system design, system design choices, passive and low speed active optical components for fiber system, micro-optic components, lens-less components.

Optical Fiber Components couplers, Isolators and Circulators, Multiplexers, Bragg grating, Fabry-perot Filters, Mach zenderinterferometers, Arrayed waveguide grating, tunable filters, hi-channel count multiplexer architectures, optical amplifiers, direct and external modulation transmitters, pump sources for amplifiers, optical switching and wave length converters.

UNIT III

Optical Fiber Techniques-1 Modulation and demodulation, signal formats, direction detection receivers, coherent detection. **Optical Fiber Techniques-2** Optical switching, polarization control, inter office transmission system, trunking system, performance and architecture, undersea cable system, optical fibers in loop distribution system, photonic local network.

UNIT IV

Access Network Network architecture, HFC, FTTC, optical access network architecture, deployment considerations, upgrading the transmission capacity, SDM, TDM, WDM, application areas, inter exchange, undersea, local exchange networks; Packaging and cabling of photonics components-photonic packet switching, OTDM, multiplexing and demultiplexing, optical logic gates,

synchronization, broadcast and select WDM network, OTDM testbeds.

UNIT V

Soliton Communication Basic principle, metropolitan optical network, cable TV network, optical access network, photonics simulation tools, error control coding techniques, nonlinear optical effects in WDM transmission.

Text Books

1. Gil Held, "Deploying Optical Network Components".
2. Gerd Kaiser, "Optical Fiber Communication", McGraw Hill.
3. Rajiv Ramaswamy and Kumar and N. Sivaranjan, "Optical Networks".

References

1. S E Miller, A G Chynoweth, "Optical Fiber Telecommunication".

Course Outcomes-Program Outcomes -Program Specific Outcomes-(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	H	M	L				H	L	
CO2	H	M		L			H	L	
CO3	H	M		L			H	M	L
CO4	H		L			M	H	M	
CO5	H	M	L				H	M	
CO6									

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19MECT07: CODING THEORY AND TECHNIQUES

Credits - 3 **Sessional Marks: 30**

L: T: P: 3:0:0 **University Exam Marks: 70**

Course Objectives

Introduce the principles and applications of information theory.

1.To teach study how information is measured in terms of probability and entropy, and the relationships aong conditional and joint entropies.

2.To teach coding schemes, including error correcting codes.

3.Explain how this quantitative measure of information may be used in order to build efficient solutions to multitudinous engineering problems.

Course Outcomes

CO1. Design and analysis of different coding methods.

CO2.Design a digital communication system by selecting an appropriate error correcting codesfor a particular application.

CO3.Explain various methods of generating and detecting different types of error correcting codes

CO4.Formulate the basic equations of linear block codes.

CO5.Compare the performance of digital communication system by evaluating the probability oferror for different error correcting codes

UNIT I

Coding for Reliable Digital Transmission and storage Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies. Linear Block Codes: Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system

UNIT II

Cyclic Codes Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding ,Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

UNIT III

Convolutional Codes Encoding of Convolutional Codes, Structural and Distance Properties, maximum likelihood decoding, Sequential decoding, Majority- logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

UNIT IV

Turbo Codes LDPC Codes- Codes based on sparse graphs, Decoding for binary erasure channel, Log-likelihood algebra, Brief propagation, Product codes, Iterative decoding of product codes, Concatenated convolutional codes- Parallel concatenation, The UMTS Turbo code, Serial concatenation, Parallel concatenation, Turbo decoding

UNIT V

Space-Time Code Introduction, Digital modulation schemes, Diversity, Orthogonal space- Time Block codes, Alamouti's schemes, Extension to more than Two Transmit Antennas, Simulation Results, Spatial

Multiplexing : General Concept, Iterative APP Preprocessing and Per-layer Decoding, Linear Multilayer Detection, Original BLAST Detection, QL Decomposition and Interface Cancellation, Performance of Multi – Layer Detection Schemes, Unified Description by Linear Dispersion Codes.

Text Books

1.Shu Lin, Daniel J.Costello,Jr, "Error Control Coding- Fundamentals and Applications", Prentice Hall, Inc.
2.Man Young Rhee, "Error Correcting Coding Theory", 1989, McGraw-Hill

Reference Books

1. Bernard Sklar, "Digital Communications-Fundamental and Application", PE.
2. 2. John G. Proakis, "Digital Communications", 5th Edition, 2008, TMH.
3. Salvatore Gravano, "Introduction to Error Control Codes", Oxford Todd
4. K.Moon, "Error Correction Coding – Mathematical Methods and Algorithms", 2006, Wiley India.
5. Ranjan Bose, "Information Theory, Coding and Cryptography", 2nd Edition, 2009, TMH.

Course Outcomes-Program Outcomes -Program Specific Outcomes-(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	H	M		M		L	H	M	
CO2	L	M		M		H	M		H
CO3	H	M	H				H	M	
CO4	H	M			L	M	H	M	M
CO5	H	M		L			H	M	
CO6									

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19MECT08: DETECTION AND ESTIMATION THEORY

Credits - 3 **Sessional Marks: 30**

L: T: P: 3:0:0 **University Exam Marks: 70**

Course Objectives

1.To enable the students to acquire the fundamental concepts of Signal Detection and Estimation
2.To get familiarize with different Hypotheses in detection and estimation problems
3.To introduce the methods of Detection and estimation of signals in white and non-white Gaussian noise.
4.To familiarize with the detection of random signals.

Course Outcomes

1.Acquire basics of detection theory used for signal detection and estimation.
2.Understand different hypotheses in detection and estimation problems
3.Analyse the conceptual basics of detection and estimation of signals in white and non-white Gaussian noise.
4.Compare different estimation models of random signals.
5.Analyse cost minimization technique for different estimators.

UNIT I

Review of Vector Spaces Vectors and matrices: notation andproperties, orthogonality and linear independence, bases, distance properties, matrix operations, Eigen values and eigenvectors.

UNIT II

Properties of Symmetric Matrices Diagonalizationofsymmetric matrices, symmetric positive definite and semi definite matrices, principal component analysis (PCA), singular value decomposition.

UNIT III

Stochastic Processes Time average and moments, ergodicity, power spectral density, covariance matrices, response of LTI system to random process, cyclostationary process, and spectral factorization.

UNIT IV

Detection Theory Detection in white Gaussian noise, correlator and matched filter interpretation, Bayes' criterion of signal detection, MAP, LMS, entropy detectors, detection in colored Gaussian noise, Karhunen-Loeve expansions and whitening filters.

UNIT V

Estimation Theory Minimum variance estimators, Cramer-Rao lower bound, examples of linear models, system identification, Markov classification, clustering algorithms.Topics in Kalman and Weiner Filtering: Discrete time Wiener-Hopf equation, error variancecomputation, causal discrete time Wiener filter, discrete Kalman filter, extended Kalman filter, examples. Specialized Topics in Estimation:Spectralestimationmethodslike MUSIC, ESPIRIT, DOA Estimation.

Text Books

1.Steven M. Kay, "Fundamentals of Statistical Signal Processing, Volume I: Estimation Theory",Prentice Hall, 1993
2. Steven M. Kay, "Fundamentals of Statistical Signal Processing, Volume II: Detection Theory", 1st Edition, Prentice Hall, 1998

Reference Books

1.Thomas Kailath, BabakHassibi, Ali H. Sayed, "Linear Estimation", Prentice Hall, 2000.

2.H. Vincent Poor, "An Introduction to Signal Detection and Estimation", 2nd Edition, Springer, 1998.

Course Outcomes-Program Outcomes -Program Specific Outcomes-(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	H	M					H		
CO2	H	M					H		
CO3	H	M					H		
CO4	H	M					H	M	
CO5		M	H						H
CO6									

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19MBST01: RESEARCH METHODOLOGY AND IPR

Credits – 2 | **Sessional Marks: 30**
L: T: P:: 2:0:0 | **University Exam Marks: 70**

Course Objectives

1. To gain familiarity in order to obtain insights into selected area of research.
2. To acquaint procedures and techniques used to find the results of a research problem.
3. To familiarize methods for data analysis and design.
4. To know the steps to collect information about IPR.
5. To implement IPR protection strategies and other facilities provided by R &D in case of new innovation.

Course Outcomes

After successful completion of course the student should be able to

CO1. Understand the research problem formulation

CO2. Analyze research related information

CO3. Follow research ethics

CO4. Understand that today's world is controlled by computer, information technology but tomorrow world will be ruled by ideas, concept and creativity.

CO5. Understand that when IPR would take such important place in growth of individuals and nation, it is needless to emphasise the need of information about intellectual property rights to be promoted among students in general and engineering in particular.

CO6. Understand that IPR protection provides an incentive to inventors for further research work and investment in R&D, which leads to creation of new and better products, and intern brings about economic growth and social benefits.

UNIT I

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research

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problem, Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT II

Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT III

Design and Analysis of Experiments: Introduction to ANOVA with examples; Factorial design: 2^n design; Taguchi method: Introduction and application of taguchi method for optimization of process.

UNIT IV

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT

UNIT V

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology, Patent information and databases, Geographical Indications

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc, Traditional knowledge Case Studies, IPR and IITs.

Text Book

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students".

Reference Books

1. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
2. Ranjit Kumar, "Research Methodology: A Step by Step Guide for beginners", 2 nd Edition
3. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
4. Mayall, "Industrial Design", McGraw Hill, 1992.
5. Niebel, "Product Design", McGraw Hill, 1974.

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19MECP01: VLSI LAB

Credits - 2 **Sessional Marks: 40**

L: T: P: 0:0:4 **University Exam Marks: 60**

Course Objectives

The students are required to design and implement the Layout of the following experiments of using CMOS 130nm Technology with appropriate Industrial standard software

Course Outcomes

At the end of this course student will be able to

CO1.Design CMOS logic circuits using PYXIS schematic editor.

CO2.The design shall include gate level design / transistor level design/ hierarchical design, logic synthesis, simulation and verification, scaling of different CMOS circuits.

CO3.DC/Transient analysis, verification of layouts (DRC, LVS).

LIST OF EXPERIMENTS

1. Inverter Characteristics
2. Realization of logic gates
3. Full Adder
4. RS-Latch
5. D-Latch
6. Synchronous Counter
7. Asynchronous Counter
8. Static RAM Cell
9. Differential amplifier
10. Ring oscillator.

Lab Requirements

Software: Industrial standard software with prefectural license consisting of required simulator, synthesizer, analyzer etc. in an appropriate integrated environment.

Course Outcomes-Program Outcomes -Program Specific Outcomes-(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	M	H					H		

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CO2	L	H	M				H	M	
CO3		H	M				M	H	L
CO4			L	M	H	H	H	M	
CO5	M	H						M	H

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19MECP02: SIGNAL PROCESSING LAB

Credits - 2 **Sessional Marks: 40**

L: T: P: 0:0:4 **University Exam Marks: 60**

Course Objectives

1.Develop simple algorithms for signal processing applications.
2. Write programs to perform computation in signal processing using MATLAB
3.To design and test digital filters for signal processingapplications.

Course Outcomes

After completion of the practical course the student will be able to
CO1. Analyze and process signals in the discrete domain
CO2.Ability to identify the signals using MATLAB
CO3. Design and analyse offilter functionsto suit to a for Specificapplication.
CO4.Able to use matlab tools signal processing applications.
CO5.Develop andanalyzethe filters on various types of signals operations.

LIST OF EXPERIMENTS USING MATLAB

1. Bilinear Transformations
2. Impulse Invariant Transformations
3. Filter function operation
4. Design of Filter low pass Filter
5. Design and Analysis of Butterworth Low pass filter, High pass filter and Band pass filter
6. Design and testing of Chebysev Type 1 Low pass Filter, High pass filter and Band pass filter.
7. Design and testing of Chebysev Type 2 Low pass Filter, High pass filter and Band pass filter.
8. Comparision of FIR and IIR Low pass Filter Characteristics,
9. Comparision of FIR and IIR High pass Filter Characteristics
10. Comparision of FIR and IIR Band pass Filter Characteristics

Course Outcomes-Program Outcomes -Program Specific Outcomes-(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	H	M		M		L	H		L
CO2		M	H		M			H	L
CO3			L		M	L	H		L
CO4	L	M	M				H	M	L
CO5	H	M					H	M	L

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19MECT09: FPGA Architecture & Applications

Credits - 3 **Sessional Marks: 30**

L: T: P: 3:0:0 **University Exam Marks: 70**

Course Objectives

1.Familiarize the concepts of basic complex programmable logic devices.
2.Can able to study architecture of FPGA and SRAM Programmable FPGA.
3.Can understand the architecture of Anti fuse programmed FPGA.
4.Can design the applications of combinational and sequential FPGAs.

Course Outcomes

At the end of this course student will be able to
CO1.Analyse different types of simple and complex programmable logic devices.
CO2.Understand different types of Field Programmable Gate Arrays.
CO3.Evaluate architecture of SRAM Programmable FPGAs.
CO4.Explain the device architecture ofAnti-Fuse Programmed FPGAs.
CO5.Design the applications of combinational and sequential circuits.

UNITI

Introduction to Programmable Logic Devices Introduction, Simple Programmable Logic Devices – Read Only Memories, Programmable Logic Arrays, Programmable Array Logic, Programmable Logic Devices/Generic Array Logic; Complex Programmable Logic Devices – Architecture of Xilinx Cool Runner XCR3064XL CPLD, CPLD Implementation of a Parallel Adder with Accumulation.

UNITII

Field Programmable Gate Arrays Organization of FPGAs, FPGA Programming Technologies, Programmable Logic Block Architectures, Programmable Interconnects and Programmable I/O blocks in FPGAs, Dedicated Specialized Components of FPGAs and Applications of FPGAs.

UNIT III

SRAM Programmable FPGAs Introduction, Programming Technology, Device Architecture, The Xilinx XC2000, XC3000 and XC4000 Architectures.

UNIT IV

Anti-Fuse Programmed FPGAs Introduction, Programming Technology, Device Architecture, the Actel ACT1, ACT2 and ACT3 Architectures.

UNIT V

Design Applications: General Design Issues, Counter Examples, A Fast Video Controller, A Position Tracker for a Robot Manipulator, A Fast DMA Controller, Designing Counters with ACT devices, Designing Adders and Accumulators with the ACT Architecture.

Text Books

1. Field Programmable Gate Array Technology - Stephen M. Trimberger, Springer International Edition.
2. Digital Systems Design - Charles H. Roth Jr, LizyKurian John, Cengage Learning.

Reference

1. Field Programmable Gate Arrays - John V. Oldfield, Richard C. Dorf, Wiley India.
2. Digital Design Using Field Programmable Gate Arrays - Pak K. Chan/SamihaMourad, Pearson Low Price Edition.
3. Digital Systems Design with FPGAs and CPLDs - Ian Grout, Elsevier, Newnes.
4. FPGA based System Design - Wayne Wolf, Prentice Hall Modern Semiconductor Design Series.

Course Outcomes-Program Outcomes -Program Specific Outcomes-(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	M	H					H		
CO2	H	M					H		
CO3	H	M					H	M	
CO4	H	M					H	M	
CO5	H	M		L			H	M	

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19MECT10: WIRELESS COMMUNICATIONS AND NETWORKS

Credits - 3 **Sessional Marks: 30**

L: T: P: 3:0:0 **University Exam Marks: 70**

Course Objectives

The objectives of this course is to make the students

1.To understand mobile radio communication principles and to study the recent trends adopted in cellular systems and wireless standards.

2.To provide an overview of Wireless Communication networks area and its applications in communication engineering.

3.To appreciate the contribution of Wireless Communication networks to overall technological growth.

4.To understand the various terminology, principles, devices, schemes, concepts, algorithms and different methodologies used in Wireless Communication Networks.

Course Outcomes

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

CO1.Understand fundamental treatment of wireless communications and the Cellular Concept System Design, Fundamental concepts like frequency reuse, Radio WavePropagation Basic Propagation Mechanisms and Diffraction Models.

CO2.Analyze the radio channel characteristics and the cellular principle.

CO3.Understand the relation between the user features and underlying technology.

CO4.Analyze mobile communication systems for improved performance.

CO5.Compare wireless and Telephone networks.

UNITI

Wireless Communications & System Fundamentals Introduction to wireless communications systems, examples, Comparisons & trends, 2nd and 3rd generation wireless networks, Cellular concepts-frequency reuse, strategies, interference & system capacity, trunking & grade of service, improving coverage &capacity in cellular systems.

Modern wireless communication systems Blue tooth, Overview, Radio specification, Base band specification, Links manager specification, Logical link control and adaptation protocol, Introduction to WLL Technology.

UNIT II

Mobile Radio Propagation Large-Scale Path Loss, Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, the three Basic Propagation Mechanisms,Reflection, Ground Reflection (Two-Ray) Model,Diffraction, Scattering,Practical Link Budget Design Using Path Loss Models,Outdoor Propagation Models,Indoor Propagation Models, Signal Penetration into Buildings, Ray Tracing and Site Specific Modelling.

UNIT III

Mobile Radio Propagation Small-Scale Fading and Multipath. Small-Scale Multipath Propagation,Impulse Response Model of a Multipath Channel, Small-Scale Multipath Measurements, Parameters of Mobile Multipath Channels,Types of Small-Scale Fading, Rayleigh and Rician Distributions,Statistical Models for Multipath Fading Channels, Theory of Multipath Shape Factors for Small-Scale Fading Wireless Channels.

UNIT IV

Equalizationand Diversity Fundamentals of Equalization, Training A Generic Adaptive Equalizer, Equalizers in a Communications Receiver, Survey of Equalization Techniques, Linear Equalizers, Nonlinear Equalization, Algorithms for Adaptive Equalization, Fractionally Spaced Equalizers, Diversity Techniques, RAKE Receiver, Packet Radio, Capacity of Cellular Systems.

UNIT V

Wireless Networking Introduction, Differences Between Wireless and Fixed Telephone Networks, Traffic

Routing in Wireless Networks, Wireless Data Services, Common Channel Signalling (CCS), Integrated Services Digital Network (ISDN),Personal Communication Services/Networks, Protocols for Network Access, Network Databases, Universal Mobile Telecommunication System (UMTS), Global System for Mobile (GSM), CDMA Digital Cellular Standard.

Text Books

1.Wireless Communications By Theodore Rappaport , Pearson Publications
2.Wireless communications Technology By Roy Blake , Thomson Learning Publications
3.Mobile and Personal Communication System and Services By Raj Pandya , PHI.

Reference Books

1.WCY Lee, Mobile Communications Design Fundamentals, Prentice Hall, 1993.
2.Raymond Steele, Mobile Radio Communications, IEEE Press, New York, 1992.
3.AJ Viterbi, CDMA: Principles of Spread Spectrum Communications, Addison Wesley, 1995.
4.VK Garg&JE Wilkes, Wireless & Personal Communication Systems, Prentice Hall, 1996.

Course Outcomes-Program Outcomes -Program Specific Outcomes-(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	H	M	L				H		
CO2	L	M	H	L			H	M	
CO3	H	M	L				H		
CO4	L	M	H	L			H	M	
CO5			H		L	L	L	M	H

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19MECT11: LOW POWER VLSI DESIGN

Credits - 3 **Sessional Marks: 30**
L: T: P: 3:0:0 **University Exam Marks: 70**

Course Objectives

1.To know the sources of power consumption in CMOS circuits
2.To understand the various power reduction techniques and the power estimation methods.
3.To study the design concepts of low power circuits.
4.To study the concepts on different levels of power estimation.
5.To study the concepts on different levels of optimization techniques.

Course Outcomes

After successful completion of this course, the students should be able to
CO1.Know the basics and advanced techniques in low power design as reduction of power is much needed to enhance the performance of the system
CO2.Understand about the Circuit &Logic Techniques
CO3.Know the basics and advanced techniques in Low Power CMOS VLSI Design.
CO4.Understand about the Synthesis for Low Power Design and Test of Low Voltages
CO5.Understand about the Low Energy Course

UNIT I

Low power design, an over view Introduction to low- voltage low power design, limitations, Silicon-on-Insulator.
MOS/Bi-CMOS Processes: Bi-CMOS processes, Integration and Isolation considerations, Integrated Analog/Digital CMOS Process.

UNIT II

Low-voltage/low power CMOS/ BICMOS Processes Deep submicron processes, SOI CMOS, lateral BJT on SOI, future trends and directions of CMOS/Bi-CMOS processes.

UNIT III

CMOS and Bi-CMOS logic gates Conventional CMOS and Bi-CMOS logic gates, Performance Evaluation.
Low power latches and flip flops Evolution of Latches and Flip flops-quality measures for latches and Flip flops, Design perspective.

UNIT IV

Architecture and system Power and Performance Management, Microprocessor Sleep Modes, Perfomance Management, Adaptive Filtering, Switching Activity Reduction, Guarded Evaluation, Bus Multiplexing, Glitch Reduction by Pipelining

UNIT V

Special techniques Power Reduction in Clock Networks, CMOS Floating Node,
Low Power Bus, Delay Balancing, Low Power Techniques for SRAM.

Text Books

1.CMOS/Bi-CMOS ULSI low voltage, low power by Yeo Rofail/ Gohl (3 Authors)-Pearson Education Asia 1st Indian reprint, 2002.
2.Gary K. Yeap,"Practical Low Power Digital VLSI Design", KAP,2002.

References

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1.P. Rashinkar, Paterson and L. Singh, "Low Power Design Methodologies", Kluwer Academic, 2002
2.Kaushik Roy, Sharat Prasad, "Low power CMOS VLSI circuit design", John Wiley sonsInc.,2000.
3.J.B.Kulo and J.H Lou, "Low voltage CMOS VLSI Circuits", Wiley, 1999.
4.A.P.Chandrasekaran and R.W.Broadersen, "Low power digital CMOS design", Kluwer,1995.
5.Gary Yeap, "Practical low power digital VLSI design", Kluwer, 1998.

Course Outcomes-Program Outcomes -Program Specific Outcomes-(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	H	M					H	M	
CO2		H	L	L			M	H	
CO3		M	H	L			H	M	L
CO4	M	H		L			M	H	L
CO5		H		M			L	H	

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19MECT12: DESIGN FOR TESTABILITY

Credits - 3 **Sessional Marks: 30**

L: T: P: 3:0:0 **University Exam Marks: 70**

Course Objectives

1.To impart the knowledge on testability of digital ASIC devices and VLSI technology trends.
2.To enable the students to understand the manual techniques for generating tests for faults in digital circuits and Fault diagnosis algorithms.
3.To impart the knowledge on design verification, Test Evaluation, the concept SCOAP Controllability and Observability.
4.To impart the knowledge on testability measures and the concept of BIST architecture.
5.To make the students to know the various techniques which are designed to reduce the amount of input test patterns required to ensure that an acceptable level of Fault coverage has been obtained.

Course Outcomes

At the end of the course, student will be able to
CO1.Apply the fundamental concepts of Testing in VLSI design.
CO2.Apply simulation algorithms for verification and validation.
CO3.Evaluate a digital system using Testability Measures.
CO4.Develop skills in the modelling of BIST Architecture and Memory BIST.
CO5.Assess logic and technology-septic parameters in Boundary Scan Standards

UNIT I

Introduction to test and design for testability (DFT) fundamentals Modeling: Modeling Digital Circuits at Logic Level, Register Level and Structural Models. Levels of Modeling. Logic Simulation: Types of Simulation, Delay Models, Element Evaluation, Hazard Detection, Gate Level Event Driven Simulation.

UNIT II

Fault modeling Logic Fault Models, Fault Detection and Redundancy, Fault Equivalence and Fault Location. Single Stuck and Multiple Stuck – Fault Models. Fault Simulation Applications, General Techniques for Combinational Circuits.

Testing for single stuck faults (SSF) Automated Test Pattern Generation (ATPG/ATG) For Ssfs In Combinational and Sequential Circuits, Functional Testing With Specific Fault Models. Vector Simulation – ATPG Vectors, Formats, Compaction and Compression, Selecting ATPG Tool.

UNIT III

Design for testability Testability Trade-Offs, Techniques. Scan Architectures and Testing – Controllability and Absorbability, Generic Boundary Scan, Full Integrated Scan, Storage Cells for Scan Design.Board Level and System Level DFT Approaches.Boundary Scans Standards.Compression Techniques – Different Techniques, Syndrome Test and Signature Analysis.

UNIT IV

Built-in self-test (BIST) BIST Concepts and Test Pattern Generation. Specific BIST Architectures – CSBL, BEST, RTS, LOCST, STUMPS, CBIST, CEBS, RTD, SST, CATS, CSTP, BILBO. Brief Ideas on Some Advanced BIST Concepts and Design for Self-Test at Board Level.

Memory BIST (MBIST) Memory Test Architectures and Techniques – Introduction to Memory Test, Types of Memories and Integration, Embedded Memory Testing Model. Memory Test Requirements for MBIST.

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UNIT V

Brief ideas on embedded core testing Introduction to Automatic in Circuit Testing (ICT), JTAG Testing Features.

Text Books

1.MironAbramovici, Melvin A. Breur, Arthur D.Friedman, Digital Systems Testing and Testable Design, Jaico Publishing House, 2001.

References

1.Alfred Crouch, Design for Test for Digital ICs & Embedded Core Systems, Prentice Hall.
2. Robert J.Feugate, Jr., Steven M.Mentyn, Introduction to VLSI Testing, Prentice Hall, Englehood Cliffs, 1998.

Course Outcomes-Program Outcomes -Program Specific Outcomes-(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	H						H	M	
CO2	M	H	L				H	M	
CO3		M	H	L					H
CO4			H	H			M	L	M
CO5		L		H			H		
CO6									

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19MECT13: SYSTEM ON CHIP DESIGN

Credits - 3 **Sessional Marks: 30**

L: T: P: 3:0:0 **University Exam Marks: 70**

Course Objectives

This course covers SoC design and modeling techniques with emphasis on architectural exploration, assertion-driven design and the concurrent development of hardware and embedded software.

Course Outcomes

This course is designed for students to learn and be able to

CO1.Analyze the functional and nonfunctional performance of the system early in the design process to support design decisions.

CO2.Analyze hardware/software tradeoffs, algorithms, and architectures to optimize the system based on requirements and implementation constraints.

CO3.Analyze tradeoffs and explore architecture and micro-architecture design spaces to develop and synthesize custom hardware accelerators

CO4.Understand hardware, software, and interface synthesis.

CO5.Use co-simulation to validate system functionality.

UNIT I

Introduction to the System Approach System Architecture, Components of the system, Hardware & Software, Processor Architectures, Memory and Addressing. System level interconnection, An approach for SOC Design, System Architecture and Complexity.

UNIT II

Processors Introduction , Processor Selection for SOC, Basic concepts in Processor Architecture, Basic concepts in Processor Micro Architecture, Basic elements in Instruction handling. Buffers: minimizing Pipeline Delays, Branches, More Robust Processors, Vector Processors and Vector Instructions extensions, VLIW Processors, Superscalar Processors.

UNIT III

Memory Design for SOC Overview of SOC external memory, Internal Memory, Size, Scratchpads and Cache memory, Cache Organization, Cache data, Write Policies, Strategies for line replacement at miss time, Types of Cache, Split – I, and D – Caches, Multilevel Caches, Virtual to real translation , SOC Memory System, Models of Simple Processor –memory interaction.

UNIT IV

Interconnect Customization and Configuration Inter Connect Architectures, Bus: Basic Architectures, SOC Standard Buses , Analytic Bus Models, Using the Bus model, Effects of Bus transactions and contention time. SOC Customization: An overview, Customizing Instruction Processor, Reconfiguration Technologies, Mapping design onto Reconfigurable devices, Instance- Specific design, Customizable Soft Processor, Reconfiguration - overhead analysis and trade-off analysis on reconfigurable Parallelism.

UNIT V

Application Studies / Case Studies SOC Design approach, AES algorithms, Design and evaluation, Image compression – JPEG compression.

Text Books

1.Computer System Design System-on-Chip - Michael J. Flynn and Wayne Luk, Wiely India Pvt. Ltd.

2.ARM System on Chip Architecture – Steve Furber –2nd Ed., 2000, Addison Wesley Professional.

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Reference Books

1.Design of System on a Chip: Devices and Components – Ricardo Reis, 1st Ed., 2004, Springer
2.Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology) – Jason Andrews – Newnes, BK and CDROM.
3.System on Chip Verification – Methodologies and Techniques – Prakash Rashinkar, Peter Paterson and Leena Singh L, 2001, Kluwer Academic Publishers.

Course Outcomes-Program Outcomes -Program Specific Outcomes-(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	M	H	L				H		
CO2	L	H	M	M			H	L	
CO3		L	M	H		L		M	H
CO4		L	M	H		L	H	M	
CO5		L	L	M		H		L	H

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19MECT04: DIGITAL IMAGE AND VIDEO PROCESSING

Credits - 3 **Sessional Marks: 30**

L: T: P: 3:0:0 **University Exam Marks: 70**

Course Objectives

The objective of this course is to make the students:

1.To learn basic concepts of image processing, fundamentals and mathematical models in digital image and video processing.

2.Ability to study different types of image transforms for image and video processing

3.To develop time and frequency domain techniques for image enhancement.

4.To understand Image segmentation, restoration, and morphological signal processing with applications.

5.To expose the students to current applications, techniques and issues in image and video processing.

Course Outcomes:

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

CO1.Understand theory and models in Image and Video Processing.

CO2. Interpret and analyze 2D signals in frequency domain through image transforms.

CO3. Apply quantitative models of image and video processing for various engineering applications.

CO4. Develop innovative design for practical applications in various fields.

CO5.Understand different methods, models for video processing and motion estimation.

UNITI

Digital image fundamentals image acquisition, representation, visual perception, quality measures, sampling and quantization, basic relationship between pixels, imaging geometry, color spaces, video spaces, analog& digital video interfaces, video standards.

UNITII

Two dimensional systems properties, analysis in spatial, frequency and transform domains, image transforms-DFT, DCT, sine, Hadamard, Har, Slant, KL transforms, Wavelet transform.

UNITIII

Image enhancementpoint processing, spatial filtering, image restoration-inverse filtering, de-blurring, image compression- lossless &lossy compression techniques, and standards for image compression- JPEG, JPEG 200, Image segmentation-feature extraction, region oriented segmentation, descriptors, morphology, image recognition.

UNITIV

Image Compression Introduction, Need for image compression, Redundancy in images, Classification of redundancy in images, image compression scheme, Classification of image compression schemes, Fundamentals of information theory, Run length coding, Shannon – Fano coding, Huffman coding, Discrete cosine transform, JPEG coding, Transformed based compression, Image compression standard, JPEG Standards.

Basic Steps of Video Processing Analog Video, Digital Video. Time-Varying Image Formation models Three-Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation.

UNIT-IV

2-D Motion Estimation: Optical flow, General Methodologies, Pixel Based Motion Estimation, Block-Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Video coding.

Text Books

1.R.C. Gonzalez and Woods, "Digital Image Processing" - 3rd Ed., Pearson.-2002
2. Yao Wang, Joern Ostermann and Ya–quin zhang, "Video Processing and Communications" – Zhang. 1st Ed., PH Int.-2002.

Refrence Books

1. ScotteUmbaugh, "Digital Image Processing and Analysis-Human and Computer Vision Application with CVIP Tools" – 2nd Ed, CRC Press, 2011.
2. M. Tekalp, "Digital Video Processing", – Prentice Hall International.
3. Bovik, Handbook ofimage and video processing, academic press,2000

Course Outcomes-Program Outcomes -Program Specific Outcomes-(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSOS1	PSOS2		PSOS3
CO1	H	L		M	M		H			
CO2	L	M		H	L		H	M		
CO3	L	M	M	M	M	H		H		L
CO4			H	M	L	M	H	L		M
CO5	H	M	L		H	L	M	H		

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19MECT15: MIMO System

Credits - 3 **Sessional Marks: 30**
L: T: P: 3:0:0 **University Exam Marks: 70**

Course Objectives

The main objective of the course is to
1.To make students familiar with fundamentals of wireless communication systems.
2.To understand the diversity and spatial multiplexing phenomenon in MIMO system.
3.To understand the receiver system design for MIMO.
4.To become familiar with OFDM and MIMO-OFDM systems.

Course Outcomes

After studying this course the students would gain enough knowledge of
CO1.Emerging issues for implementing MIMO wireless channels.
CO2.Different fading channel distributions in multipath wireless channel.
CO3.OSTBC design for multiple antenna system.
CO4.Computation of performance parameters of MIMO wireless system.

UNIT I

Introduction to Multi-antenna Systems, Motivation, Types of multi-antenna systems, MIMO vs. multi-antenna systems.

UNIT II

Diversity, Exploiting multipath diversity, Transmit diversity, Space-time codes, The Alamouti scheme, Delay diversity, Cyclic delay diversity, Space-frequency codes, Receive diversity, The rake receiver, Combining techniques, Spatial Multiplexing, Spectral efficiency and capacity, Transmitting independent streams in parallel, Mathematical notation

UNIT III

The generic MIMO problem, Singular Value Decomposition, Eigenvalues and eigenvectors, Equalising MIMO systems, Disadvantages of equalising MIMO systems, Predistortion in MIMO systems, Disadvantages of pre-distortion in MIMO systems, Pre-coding and combining in MIMO systems, Advantages of pre-coding and combining, Disadvantages of precoding and combining, Channel state information.

UNIT IV

Codebooks for MIMO, Beamforming, Beamforming principles, Increased spectrum efficiency, Interference cancellation, Switched beamformer, Adaptive beamformer, Narrowband beamformer, Wideband beamformer

UNIT V

Case study MIMO in LTE, Codewords to layers mapping, Pre-coding for spatial multiplexing, Pre-coding for transmit diversity, Beamforming in LTE, Cyclic delay diversity based pre-coding, Pre-coding codebooks, Propagation Channels, Time & frequency channel dispersion, AWGN and multipath propagation channels, Delay spread values and time variations, Fast and slow fading environments, Complex baseband multipath channels, Narrowband and wideband channels, MIMO channel models

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Textbooks

1. Claude Oestges, Bruno Clerckx, "MIMO Wireless Communications : From Real-world Propagation to Space-time Code Design",Academic Press, 1st edition, 2010.
2. MohinderJanakiraman, "Space - Time Codes and MIMO Systems", Artech House Publishers, 2004.

Course Outcomes-Program Outcomes -Program Specific Outcomes-(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	H	M					H		
CO2		H		M				H	M
CO3	H	M	L				H		
CO4		H					H		

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19MECT16: ADAPTIVE SIGNAL PROCESSING

Credits - 3 **Sessional Marks: 30**

L: T: P: 3:0:0 **University Exam Marks: 70**

Course Objectives

1.To understand the basics of adaptive system.
2.To make them familiar with gradient search algorithms and functions.
3.To introduce LMS & RLS algorithms.
4.To be acquainted with random variables and Kalman filters.

Course Outcomes

At the end of the course students will be able to
CO1.Demonstrate in-depth knowledge in required mathematical frame work, characteristics of adaptive systems, searching algorithm such as gradient and steepest descent.
CO2.Compare Adaptive algorithms like LMS, RLS and Kalman filtering, order-recursive adaptive filters.
CO3.Analyze complex engineering problems critically in the domain of adaptive filtering forconducting research.
CO4.Solve engineering problems for feasible and optimal solutions in the core area of adaptive signal processing.
CO5.Contribute positively to multidisciplinary scientific research in signal processing with objectivity and rational analysis.

UNIT I

Introduction to Adaptive Systems Adaptive Systems Definitions, Characteristics, Applications, Example of an Adaptive System. The Adaptive Linear Combiner - Description, Weight Vectors, Desired Response Performance function - Gradient & Mean Square Error.

UNIT II

Development of Adaptive Filter Theory & Searching the Performance surface Introduction to Filtering - Smoothing and Prediction – Linear Optimum Filtering, Problem statement, Principle of Orthogonality - Minimum Mean Square Error, Wiener- Hopfequations, Error Performance - Minimum Mean Square Error. Searching the performance surface – Methods & Ideas of Gradient Search methods - Gradient Searching Algorithm & its Solution - Stability & Rate of convergence - Learning Curves.

UNIT III

Steepest Descent Algorithms: Gradient Search by Newton's Method, Method of Steepest Descent, Comparison of Learning Curves.

UNIT IV

LMS Algorithm & Applications Overview - LMS Adaptation algorithms, Stability & Performance analysis of LMS Algorithms - LMS Gradient & Stochastic algorithms - Convergence of LMS algorithm. Applications: Noise cancellation – Cancellation of Echoes in long distance telephone circuits, Adaptive Beam forming.

UNIT V

Kalman Filtering Introduction to RLS Algorithm, Statement of Kalmanfiltering problem, The Innovation Process, Estimation of State using the Innovation Process- Expression of Kalman Gain, Filtering Examples using Kalman filtering.

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Text Books

1. Adaptive Signal Processing - Bernard Widrow, Samuel D.Strearns, 2005, PE.
2. Adaptive Filter Theory - Simon Haykin-, 4th Ed., 2002, PE Asia

Reference Books

1. Optimum signal processing: An introduction - Sophocles. J. Orfamadis, 2nd Ed., 1988, McGraw-Hill, New York
2. Adaptive signal processing-Theory and Applications - S.Thomas Alexander, 1986, Springer –Verlag.
3. Signal analysis – Candy, McGraw Hill Int. Student Edition 4. James V. Candy - Signal Processing: A Modern Approach, McGraw-Hill, International Edition, 1988.

Course Outcomes-Program Outcomes -Program Specific Outcomes-(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1		H					M		
CO2	L	H	M				H		
CO3			H	H			H		
CO4		H	L				M	H	
CO5		H		H			L	H	H

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19MECP03: WIRELESS COMMUNICATION LAB

Credits - 2 **Sessional Marks: 40**

L: T: P: 0:0:4 **University Exam Marks: 60**

Course Objectives

This course aims to develop the ability to

1. Evaluate the impact of different propagation conditions in estimation of received signal power.
2. Configure different wireless communication systems and evaluate their functioning, establishing LTE and MIMO system for two way communication.
3. Find geographical position using survey plotting with the help of GPS system
4. Design microstrip patch antenna using suitable parameters
5. Analyze different protocols of WLAN System

Course Outcomes

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

CO1. Evaluate the impact of different propagation conditions in estimation of received signal power.
CO2. Configure different wireless communication systems and evaluate their functioning, establishing LTE and MIMO system for two way communication.
CO3. Find geographical position using survey plotting with the help of GPS system.
CO4. Design micro strip patch antenna using suitable parameters
CO5: Analyze different protocols of WLAN System

List of Experiments

1. Evaluate the impact of path loss and shadowing in estimation of received signal power in mobile cellular communication using fading channel mobile communication virtual lab.
2. Calculate the boundary coverage probability in a cellular system using fading channel mobile communication virtual lab.
3. Demonstrate the impact the received power levels for hand-off in case of mobile cellular communication using fading channel mobile communication virtual lab.
4. Estimate the impact of sectoring in increasing cellular system capacity using fading channel mobile communication virtual lab.
5. Examine the impact of co-channel interference on the value of SIR in mobile cellular communication using fading channel mobile communication virtual lab.
6. Study of various discrete sequences: study of various operations on discrete signals.
7. Study convolution of two discrete signals: convolution of two discrete sequences and to verify properties of convolution.
8. Path loss model: determination of path loss using OKUMURA HATA MODEL for urban, suburban and open field or rural areas.
9. Generate binary random sequence with length 10000 and plot the distribution.
10. Generate a real Gaussian noise sequence with zero mean and variance.
11. Verify the sequence has a Gaussian distribution. Plot and compare it with theoretical guassian function.
12. Assume BPSK modulation is used for SNR range 0 to 15 dB with a step of 2dB.Length= 1000 bits. Simulate: i) BER of system, ii) plot BER vs SNR performance for simulated results.
13. Setting up of LTE 2x2 MIMO system for establishing two-way communication.
14. Study of pure ALOHA and slotted ALOHA protocols for WLAN system.
15. Configure ZIGBEE module as an end device and set up a communication link with two ZIGBEE modules.

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Course Outcomes-Program Outcome – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	H	L	H	M			H	M	
CO2		M	L	L					H
CO3	H	L	M	H				H	M
CO4	H	M	L				L	H	M
CO5	H	M					H	L	

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19MECP04: FPGA LAB

Credits - 2 **Sessional Marks: 40**

L: T: P: 0:0:4 **University Exam Marks: 60**

Course objectives

1.Will learn about the hardware description language like VHDL or Verilog.
2.Should understand verification of programs output in FPGA kits.
3.Shall give intermediate inputs and verify the functioning in FPGA Kits.

Course outcomes

At the end of thispractical course student will be able to:
CO1.Develop the HDL programming code for different applications.
CO2.Ability to use the Xilinx tool and its interfacing with FPGA kit.
CO3.Ability to prepare substantial technical report on different parameters for various applicationsby using Xilinx tool.

LIST OF EXPERIMENTS

1. Realization of Logic gates.

2. Parity Encoder.

3. Random Counter

4. Single Port Synchronous RAM.

5. Synchronous FIFO.

6. ALU.

7. UART Model.

8. Dual Port Asynchronous RAM.

9. Fire Detection and Control System using Combinational Logic circuits.

10. Traffic Light Controller using Sequential Logic circuits

11. Pattern Detection using Moore Machine.

12. Finite State Machine (FSM) based logic circuit.

Lab Requirements

Software: Industrial standard software with prefectural license consisting of required simulator, synthesizer, analyzer etc. in an appropriate integrated environment.

Hardware: Desktop Computer with necessary peripherals, configuration and operating System and relevant VLSI (CPLD/FPGA) hardware Kits

Course-Outcomes-Program Outcomes-(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	H	M	L				H	M	
CO2			H	M		L	M	H	L

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CO3				M	H	L		M	H

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19MECS01: TERM PAPER CUM SEMINAR

Credits – 2 **Sessional Marks: 40**
L:T:P::0:0:4 **University Exam Marks: 60**

Course Objectives

To expose the students to the following:

1. Identify, understand and discuss current, real-world issues.
2. Improve oral and written communication skills.
3. Explore an appreciation of the self in relation to its larger diverse social and academic contexts.
4. Apply principles of ethics and respect in interaction with others.

Course Outcomes

After successful completion of course the student should be able to

CO1. Acquire in-depth knowledge in the chosen seminar topic.
CO2. Analyse critically the chosen seminar topic for arriving at conclusions.
CO3. Understand the impact of seminar output in the context of environmental sustainability.
CO4. Improve communication skills
CO5. Prepare and present a seminar report
CO6. Develop skills for continuous learning to improve knowledge and competence in the chosen field of seminar.

Course Outcomes-Program Outcomes- Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	M	-	-	H	-	L	H	M	L
CO2	-	M	-	-	H	L	M	H	L
CO3	H	-	-	M	-	L	-	M	H
CO4	-	M	H	-	-	L	M	H	L
CO5	-	-	-	L	M	H	L	H	M
CO6									

19MECJ01: PROJECT WORK PHASE – I

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19MECT17: AUDIO AND SPEECH PROCESSING

Credits - 3 **Sessional Marks: 30**

L: T: P: 3:0:0 **University Exam Marks: 70**

Course Objective

The Speech and Audio Processing subject is to spreads across a number of fundamental of signal processing for separation, recognition, transcription and enhancement.

2. The Speech and Audio Processing subject is also deals with coding, synthesis as well as applications to advanced fixed and wireless communication systems.

Course Outcomes

After successful completion of the course student will be able to

CO1.Design and implement algorithms for processing audio and speech signals.

CO2.Take into account the properties of acoustic signals and human hearing in the design of audio signal processing systems.

CO3.Understands quantization in speech production

CO4.Estimate the effect of the signal representations on sound quality.

CO5.Can explain the main principles of common audio signal processing operations (equalization, dynamic control, perceptual audio coding).

UNIT I

Introduction Speech production and modeling - Human Auditory System; General structure of Speech coders; Classification of speech coding techniques – parametric, waveform and hybrid; Requirements of speech coders –quality, coding delays, robustness.

UNIT II

Speech Signal Processing Pitch-period estimation, all-pole and all-zero filters, convolution; Power spectral density, periodogram, autoregressive model, autocorrelation estimation.Linear Prediction of Speech- Basic concepts of linear prediction; Linear Prediction Analysis of Non-stationary signals –prediction gain, examples; Levinson-Durbin algorithm; Long term and Short-term linear prediction models; Moving average prediction.

UNIT III

Speech Quantization-Scalar quantization–uniform quantizer, optimum quantizer, logarithmic quantizer, adaptive quantizer, differential quantizers; Vector quantization – distortion measures, Codebook design, codebook types.

UNIT IV

Scalar Quantization of LPC- Spectral distortion measures, Quantization based on reflection Coefficient and log area ratio, bit allocation; Line spectral frequency – LPC to LSF conversions, Quantization based on LSF,Linear Prediction Coding- LPC model of speech production; Structures of LPC encoders and Decoders; Voicing detection; Limitations of the LPC model.

UNIT V

Code Excited Linear Prediction-CELP speech production model; Analysis-by-synthesis; Generic CELP encoders and decoders; Excitation codebook search – state-save method, zero-input zero state Method; CELP based on adaptive codebook, Adaptive Codebook search; Low Delay CELP and algebraic CELP, Speech Coding Standards-An overview of ITU-T G.726, G.728 and G.729standards.

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Text Books

1. A.M.Kondoz -"Digital Speech" , Second Edition (Wiley Students_ *Edition), 2004.*
2. W.C.Chu, WileyInter science -"Speech Coding Algorithms: Foundation and Evolution of Standardized Coders", 2003.

Reference

1. Claudio Becchetti and Lucio Prina Ricotti, "Speech Recognition", John Wiley and Sons, 1999.
2. Ben gold and Nelson Morgan, "Speech and audio signal processing", processing and perception of speech and music, Wiley- India Edition, 2006 Edition.

Course Outcomes-Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	H	M					H	M	
CO2		H	L	L			M	H	
CO3		M	H	L			H	M	L
CO4	M	H		L			M	H	L
CO5		H		M			L	H	

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19MEET17: NEURAL NETWORK AND FUZZY LOGIC

Credits - 3 **Sessional Marks: 30**

L: T: P:: 3:0:0 **University Exam Marks: 70**

Course Objectives:

1. To know the Importance of AI techniques in engineering applications
2. To familiarize with the concepts of Artificial Neural networks and Biological Neural Network.
3. To study the ANN approach in various Electrical Engineering problems.
4. To impart knowledge on Fuzzy Logic and Its use in various Electrical Engineering Applications

Course Outcomes:

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

CO1. Discuss the concepts of Artificial Neural networks
CO2. Acquire the adequate knowledge about feedback networks.
CO3. Explain the learning rules and control applications of Neural Networks.
CO4. Understand the concept of fuzziness, fuzzy set theory and gain the comprehensive Knowledge of fuzzy logic control and adaptive fuzzy logic
CO5. Design of fuzzy systems for real time applications

UNIT I

Biological neuron Vs artificial neuron, structure and activation functions – Neural network architectures –learning methods, stability and convergence .Single layer networks – Mcculloh–pitts neuron model, Perceptron training and algorithm, delta learning, Windrow-Hoff learning rules, limitations, Adeline and modification.

UNIT II

Multilayer networks, architectures and modeling, BP algorithm, radial basis functions. Unsupervised Learning-Winner take all learning, out star learning, Counter propagation networks, self-organizing networks-Kohonen.

UNIT III

Grossberg, Hamming NET, MAXNET, Hopfield networks, recurrent and associative memory, BAM and ART architectures Fuzzy sets and systems – geometry of fuzzy sets – theorems – fuzzy and neural function estimators

UNIT IV

Measures of Fuzziness – Classical measures of uncertainty – measures of Dissonance – confession specificity – knowledge base defuzzification.

UNIT-V

Application to load forecasting, load flow, fault detection-unit commitments, LF control – economic dispatch, Neuro-Fuzzy controllers.

Text Books:

1. Jacek M Jurada, "Introduction to artificial Neural Systems", Jaico Publications.
2. S.Rajashekaran , G.A.VijayaLakshmiPai,"Neural Networks, Fuzzy Logic and Genetic Algorithm Synthesis and applications'',PHI,2013.

Reference Books:

1. Hans-JurgenZimmermann,"Fuzzy Set TheoryanditsApplications" ,4th,Kluwer AcademicPublishers,2006.
2. S.N. Sivanandam& S.N. Deepa ,"Principles of soft Computing", 3rdEdition,Wiley India Pvt.Ltd,2018.

Course Outcomes-Program outcomes- Program specific outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	H	-	-	L	M	-	H	-	-
CO2	H	-	-	L	M	-	H	-	-
CO3	H	-	-	L	M	-	H	-	-
C04	H	-	-	L	M	-	H	-	-
C05	-	H	-	L	M	-	-	H	-

19MCST10: INTERNET OF THINGS

Credits –3 | **Sessional Marks: 30**
L:T:P::3:0:0 | **University Exam Marks: 70**

Course Objectives

To expose the students to the following:

1. Introduction to IoT.
2. IoT Market perspective.
3. Learning concepts of Python.
4. Understand State of the Art – IoT Architecture
5. Emphasis of Real World IoT Design Constraints, Industrial Automation and Commercial Automation Building in IoT.

Course Outcomes

After successful completion of course the student should be able to

CO1. Understand the vision of IoT from a global context.
CO2. Determine the Market perspective of IoT.
CO3. Use of Devices, Gateways and Data Management in IoT.
CO4. Building state of the art architecture in IoT.
CO5. Application of IoT in Industrial and Commercial Building Automation and Real-World Design Constraints.

UNIT I

Introduction to Internet of Things: Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics,Communication protocols, Embedded Systems, IoT Levels and Templates Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle

UNIT II

IoT and M2M: Software defined networks, network function virtualization, difference between SDN and NFV for IoT, Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

UNIT III

Introduction to Python: Language features of Python, Data types, data structures, Control of flow, functions,modules, packaging, file handling, data/time operations, classes, Exception handling,Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib

UNIT IV

IoT Physical Devices and Endpoints: Introduction to Raspberry PI-Interfaces (serial, SPI, I2C)Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

UNIT V

IoT Physical Servers and Cloud Offerings: Introduction to Cloud Storage models and communication APIs,Webserver – Web server for IoT, Cloud for IoT, Python web application framework,Designing a RESTful web API

Text Books

1. ArshdeepBahga and Vijay Madisetti, "Internet of Things - A Hands-on Approach", Orient Blackswan Private Limited - New Delhi, University Press, 2015.
2. Matt Richardson and Shawn Wallace, "Getting Started with Raspberry Pi", O'Reilly, Maker Media Inc, 2013.

Reference Books

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
2. Michael Miller, "The Internet of Things", First Edition, Pearson, 2015.
3. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6:The Evolving World of M2M Communications", Wiley, 2013.

19MECT20: ADVANCED EMBEDDED SYSTEMS

Credits - 3 **Sessional Marks: 30**

L: T: P: 3:0:0 **University Exam Marks: 70**

Course objectives

Students completing this course will be well positioned to

1.Familiarize about the basic functions of embedded systems.

2.Inculcate the basic architecture of general purpose processors and its applications.

3.Gain interface between analog and digital blocks, also Software aspects of embedded systems.

4.Develop different State Machine and Concurrent Process Models.

5.Learn Evolution of complication and synthesis, Verification and reuse of intellectual property cores.

Course Outcomes

At the end of this course students will demonstrate the ability to

CO1.To understand the embedded system concepts and technologies of embedded systems.

CO2.To analyze the general process of embedded system development.

CO3.To apply Interfacing between analog and digital blocks and apply Software aspects of embedded systems.

CO4.To create finite state machines and analyze Communication and Synchronization among processes.

CO5.To remember evolution and verification of hardware/software co-simulation.

UNIT I

Introduction The concept of embedded systems design, Examples of embedded systems Design challenge, Processor technology, IC technology, Design technology. RT-Level combinational logic, Sequential logic (RT-Level), Custom single purpose processor design (RT-Level), Optimizing custom single purpose processors.

UNIT II

General Purpose Processors Basic architecture, Development environment, Application specific system depth, Set processors (ASIPs). Embedded Memories.

UNIT III

Technological aspects of embedded systems Interfacing between analog and digital blocks, signal conditioning, digital signal processing. system interfacing, interfacing with external systems, user interfacing. Design tradeoffs due to process compatibility, thermal considerations, etc., Software aspects of embedded systems: real time programming languages and operating systems for embedded systems.

UNIT IV

State Machine and Concurrent Process Models Introduction, Models Vs languages, Finite State Machine with Data path model (FSMD), Using State Machines, Program State Machine (PSM),Concurrent Process Model, Concurrent Processes, Communication among processors, Synchronization among processes, Implementation, Data flow model.

UNIT V

Introduction Automation The parallel evolution of complication and synthesis, Logic, RT, Behavioral synthesis, System synthesis and hardware/software code sign, Verification of hardware/software

co-simulation, Reuse of intellectual property cores, Embedded microcontroller cores.

Text Books

1.Embedded Systems Design – A unified Hardware/Software introduction by Frank Vahid, Tony D. Givargis, John Wiley & Sons. Inc. 2002.
2.J.W. Valvano, "Embedded Microcomputer System: Real Time Interfacing", Brooks/Cole, 2000.

Reference books

1.Jack Ganssle, "The Art of Designing Embedded Systems", Newness, 1999.
2.V.K. Madisetti, "VLSI Digital Signal Processing", IEEE Press (NY, USA), 1995.
3.David Simon, "An Embedded Software Primer", Addison Wesley, 2000.

Course Outcomes-Program Outcomes -Program Specific Outcomes-(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	H		L				H		
CO2	L	M	H	M	L			M	H
CO3				M	H		L	M	H
CO4		L	M	H				L	H
CO5			M	L		H	L	H	M

Ms. M. Krupa Swaroopa Rani Coordinator (ECE)

Dr. P. Satyanarayana BoS Chairman (I/C) (ECE)

Dr. R.V. Satyanarayana BoS Chairman (ECE)

Dr. A. Ramakrishna Rao Director, SE&T

LIST OF OPEN ELECTIVES OFFERED BY OTHER DEPARTMENTS TO CSE (2019-20)

S. No	Course Code	Course Title	Offering Department
1	19MMET22	Advanced Operations Research	MECH
2	19MBST03	Business Analytics	BS&H
3	19MCST18	Information Retrieval System	CSE
4	19MBST02	English for Research Writing	BS&H
5	19MEET19	Solar Energy Utilisation	EEE

REFER TO CONCERN DEPARTMENT

Ms. M. Krupa Swaroopa Rani
Coordinator (ECE)

Dr. P. Satyanarayana
BoS Chairman (I/C) (ECE)

Dr. R.V. Satyanarayana
BoS Chairman (ECE)

Dr. A. Ramakrishna Rao
Director, SE&T

Course Objectives

To expose the students to the following:

1. A glimpse into real world problems and challenges that need IT based solutions.
2. Create very precise specifications of the IT solution to be designed.
3. Introduce to the vast array of literature available of the various research challenges in the field of IT.
4. Characteristics of several domain areas where IT can be effectively used.
5. Use all concepts of IT in creating a solution for a problem.
6. How to improve the team building, communication and management skills of the students.

Course Outcomes

After successful completion of course the student should be able to

CO1. Acquire in-depth knowledge in the core and/or interdisciplinary area of project topic.
CO2. Undertake research and solve real world problems in the project domain.
CO3. Apply appropriate techniques, resources and modern software tools necessary for implementing the project work.
CO4. Use project results for sustainable development of the society.
CO5. Engage in continuous learning to improve knowledge and competence in the chosen subject area of project.
CO6. Function effectively as individual and a member in the project team.

Course Outcomes-Program Outcomes- Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	M	-	-	H	-	L	H	M	L
CO2	-	M	-	H	-	L	-	M	H
CO3	-	-	H	-	-	L	-	H	M
CO4	-	-	-	M	L	H	L	M	H
CO5	-	-	-	L	M	H	-	M	H
CO6	-	-	-	-	H	M	-	-	H

19MECS02: COMPREHENSIVE VIVA

Credits – 2 **Sessional Marks: 40**
L:T:P::0:0:4 **University Exam Marks: 60**

Ms. M. Krupa Swaroopa Rani Coordinator (ECE) | Dr. P. Satyanarayana BoS Chairman (I/C) (ECE) | Dr. R.V. Satyanarayana BoS Chairman (ECE) | Dr. A. Ramakrishna Rao Director, SE&T

Course Objectives

To expose the students to the following:

1. Identify, understand and discuss current, real-time issues.
2. Improve oral and written communication skills.
3. Explore an appreciation of the self in relation to its larger diverse social and academic contexts.
4. Apply principles of ethics and respect in interaction with others.

Course Outcomes

After successful completion of course the student should be able to

CO1. Prepare comprehensively to answer questions from all the courses of three semesters..
CO2. Attain Oral Presentation skills by answering questions in precise and concise manner
CO3. Gain confidence and inter-personal skills.

Course Outcomes-Program outcomes- Program specific outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	M	-	H	L	-	-	H	L	-
CO2	-	M	-	-	H	L	H	-	M
CO3	-	-	-	H	M	L	-	-	H
CO4	M	-	H	L	-	-	H	L	-
CO5	-	M	-	-	H	L	H	-	M
CO6	-	-	-	H	M	L	-	-	H

Ms. M. Krupa Swaroopa Rani Coordinator (ECE)

Dr. P. Satyanarayana BoS Chairman (I/C) (ECE)

Dr. R.V. Satyanarayana BoS Chairman (ECE)

Dr. A. Ramakrishna Rao Director, SE&T

Credits – 10 **Sessional Marks: 40**
L:T:P::0:0:20 **University Exam Marks: 60**

Course Objectives

To expose the students to the following:

1. A glimpse into real world problems and challenges that need IT based solutions.
2. Create very precise specifications of the IT solution to be designed.
3. Introduce to the vast array of literature available of the various research challenges in the field of IT.
4. Characteristics of several domain areas where IT can be effectively used.
5. Use all concepts of IT in creating a solution for a problem.
6. How to improve the team building, communication and management skills of the students.

Course Outcomes

After successful completion of course the student should be able to

CO1. Acquire in-depth knowledge in the core and/or interdisciplinary area of project topic.
CO2. Undertake research and solve real world problems in the project domain.
CO3. Apply appropriate techniques, resources and modern software tools necessary for implementing the project work.
CO4. Use project results for sustainable development of the society.
CO5. Engage in continuous learning to improve knowledge and competence in the chosen subject area of project.
CO6. Function effectively as individual and a member in the project team.

Course Outcomes-Program Outcomes- Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	M	-	-	H	-	L	M	H	L
CO2	-	M	-	H	-	L	-	M	H
CO3	-	-	H	-	-	L	M	H	L
CO4	-	-	-	M	-	H	-	M	H
CO5	-	-	-	L	M	H	H	M	-
CO6	-	-	-	L	H	M	-	-	H

19MECJ02: PROJECT WORK PHASE – II

Credits – 16 **Sessional Marks: 40**
L:T:P::0:0:32 **University Exam Marks : 60**

Ms. M. Krupa Swaroopa Rani Dr. P. Satyanarayana Dr. R.V. Satyanarayana Dr. A. Ramakrishna Rao
Coordinator (ECE) BoS Chairman (I/C) (ECE) BoS Chairman (ECE) Director, SE&T