



ANNAMACHARYA UNIVERSITY

(ESTD UNDER AP PRIVATE UNIVERSITIES (ESTABLISHMENT AND REGULATION) ACT, 2016)

(UNIVERSITY LISTED IN UGC AS PER THE SECTION 2(f) OF THE UGC ACT, 1956)

RAJAMPET, YSR Kadapa District, AP – 516126, INDIA

B.Tech. V Semester (III Year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1	PC	24AECE51T	VLSI Design	3	0	0	3
2	PC	24AECE52T	Microprocessors and Micro controllers	3	0	0	3
3	PC	24AECE53T	Antenna & Wave Propagation	3	0	0	3
4	PE-I	24AECE5AT	Pulse and Digital Circuits	3	0	0	3
5		24AECE5BT	AI and Machine learning for ICs				
6		24AECE5CT	Control systems				
7		24AECE5DT	Internet of Things				
8		24AECE5ET	Quantum Technology for Electronics Engineers				
9	OE-I	24AECE5FT	MOOCS	3	0	0	3
10	MC	24AMBA51T	Technical Paper Writing & IPR	2	0	0	0
11	PC	24AECE51L	VLSI Design Lab	0	0	3	1.5
12	PC	24AECE52L	Microprocessors and Microcontrollers Lab	0	0	3	1.5
13	HSM	24AENG51L	Soft Skills	1	0	2	2
14	INTERN	24AECE5FI	Summer Internship 2 Months	0	0	0	2
				Total credits			22

Category	Credits
Program Core Course	12
Program Elective Course	03
Open Elective Course	03
Humanities and Social Sciences and Management course	02
Internship	02
Total Credits	22



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RAJAMPET, YSR Kadapa District, AP – 516126, INDIA

B.Tech. VI Semester (III Year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	PC	24AECE61T	Embedded Systems	3	0	0	3
2	PC	24AECE62T	Microwave Engineering	3	0	0	3
3	PC	24AECE63T	Digital Signal Processing	3	0	0	3
4	PE-II	24AECE6AT	Electronic Measurements & Instrumentation	3	0	0	3
5		24AECE6BT	Digital System Design				
6		24AECE6CT	Radar Engineering				
7		24AECE6DT	Introduction to Deep learning				
8		24AECE6ET	Biomedical Signal Processing				
9	OE-II	24AECE6FT	MOOCS	3	0	0	3
10	AC	24AAUD51T	Gender Sensitization	2	0	0	0
10	PC	24AECE61L	Embedded Systems Lab	0	0	3	1.5
11	PC	24AECE62L	Microwave Engineering Lab	0	0	3	1.5
12	PC	24AECE63L	Digital signal Processing Lab	0	0	2	1
13	SEC	24ACSE6ES	JAVA Programming	1	0	2	2
Total credits							21
Industrial/Research Internship (Mandatory) 2 Months during summer vacation							

Category	Credits
Program Core Course	13
Program Elective Course	03
Open Elective Course	03
Skill oriented course	02
Total Credits	21



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RAJAMPET, YSR Kadapa District, AP – 516126, INDIA

Title of the Course : VLSI Design
Category : PC
Year : III
Semester : I
Course Code : 24AECE51T
Branch/es : ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

1. To Comprehend the steps involved in fabrication of ICs using MOS transistor technology.
2. To learn about the VLSI design processes, Stick diagrams and Layouts.
3. To gain knowledge on the Gate Level Design concepts.
4. To learn the design of various subsystems with different VLSI Design styles.
5. To get familiar with CMOS testing techniques.

Course Outcomes:

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

1. Comprehend the steps involved in fabrication of ICs using MOS transistor technology.
2. Learn about the VLSI design processes, Stick diagrams and Layouts.
3. Gain knowledge on the Gate Level Design concepts.
4. Learn the design of various subsystems with different VLSI Design styles.
5. Familiar with CMOS testing techniques.

Unit 1 Introduction

10

Brief Introduction to IC technology MOS, PMOS, NMOS, CMOS & BiCMOS Technologies. Basic Electrical Properties of MOS and Bi CMOS Circuits: I_{DS} - V_{DS} relationships, MOS transistor Threshold Voltage, figure of merit, Transconductance, Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

Unit 2 VLSI Circuit Design Processes

13

VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, Lambda(λ)-based design rules for wires, contacts and Transistors, Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits, Limitations of Scaling.

Unit 3 Gate level Design

14

Switch logic, Alternate gate circuits. Basic Circuit Concepts: Sheet Resistance R_s and its concepts to MOS, Area Capacitances calculations, Inverter Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-in and fan-out

Unit 4 Subsystem Design

10

Barrel Shifters, High speed Adders ALUs, Multipliers-Tree based, Booth encoding and Dadda. Synchronous Counters, High density memory element Standard Cells, FPGAs, CPLDs.

Unit 5 CMOS Testing

12

Design methods, Design capture tools, Design verification tools, Need for testing, Design for testability - built in self-test (BIST)– scan design techniques.

Prescribed Textbooks:

1. Essentials of VLSI Circuits and Systems, Kamran Eshraghian, Douglas, A. Pucknell, 2005, PHI
2. Modern VLSI Design – Wayne Wolf, 3 Ed., 1997, Pearson Education.

Reference Books:

1. CMOS VLSI Design-A Circuits and Systems Perspective, Neil H.E Weste, David Harris, Ayan Banerjee, 3rd Ed, Pearson, 2009.
2. Behzad Razavi, —Design of Analog CMOS Integrated Circuits, McGraw Hill, 2003.
3. M. Rabaey, —Digital Integrated Circuits||, Anantha Chandrakasan and Borivoje Nikolic, Prentice-Hall of India Pvt. Ltd, 2nd edition, 2009

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and the World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-long Learning	PSO1	PSO2
24AECE51T.1	3	3	2	1	-	2	-	-	-	-	1	2	1
24AECE51T.2	3	2	1	1	-	2	-	1	-	-	-	2	-
24AECE51T.3	3	3	3	2	-	-	-	1	-	-	-	3	-
24AECE51T.4	3	3	3	2	-	-	-	1	-	-	-	3	-
24AECE51T.5	3	1	1	1	1	1	2	-	-	-	1	2	2



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RAJAMPET, YSR Kadapa District, AP – 516126, INDIA

Title of the Course : Microprocessors and Microcontrollers
Category : PC
Year : III
Semester : I
Course Code : 24AECE52T
Branch/es : ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

1. To learn the fundamental architectural concepts of 8086 Microprocessor.
2. To get familiar with Assembly Language Program concepts .
3. To learn about Interfacing of I/O devices with 8086.
4. To Comprehend fundamentals of the 8051 Microcontroller
5. To learn interfacing with the 8051 Microcontroller.

Course Outcomes:

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

1. Comprehend the Architectural features of 8086.
2. Analyze programming concepts of 8086.
3. Interface I/O devices with 8086.
4. Comprehend the overview of basic microcontroller.
5. Learn the interfacing methods for 8051 microcontroller for various applications

Unit 1 Introduction to 8086 Microprocessor 12

Architecture of 8086, Register organization, Memory organization, Pin diagram of 8086 - Minimum mode and maximum mode of operation, Timing diagrams. I/O Interfacing methods – I/O mapped I/O, Memory mapped I/O. Basic structure of SRAM and DRAM cell, Need For DMA.

Unit 2 8086 Programming. 14

Addressing modes of 8086, Instruction set of 8086, Assembler directives, Assembly language programs involving arithmetic, logical, branch and call instructions, sorting, string manipulation.

Unit 3 Interfacing with 8086 12

Interfacing I/O ports – latches and buffers. 8255 PPI - Architecture, various modes of operation and interfacing to 8086. Seven segment Displays, Stepper motor, D/A, A/D converter interfacing. 8251 USART architecture.

Unit 4 Overview of 8051 Microcontroller 12

roduction, Architecture, Memory Organization, Pin diagram, I/O ports. Addressing modes, Instruction Set, simple programs. On-Chip Peripherals - 8051 Interrupt Structure, Timer/Counter features, Serial Communication.

Unit 5 Interfacing of 8051 microcontroller and its applications. 10

Interfacing of Push button switches, LEDs, Seven segment displays, LCD, Keypad, D/A and A/D and Stepper motor.

Prescribed Textbook:

1. Microprocessors and Interfacing – N.Senthil Kumar, M.Saravanan, S.Jeevananthan & S.K.Singh .Oxford University Press,2012.

Reference Books:

1. Advanced microprocessor and peripherals- A.K. Ray and K.M.Bhurchandi, 2nd edition, TMH,2000.
2. Microprocessors and Interfacing- Douglas V. Hall, 2nd edition,2007.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and the World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-long Learning	PSO1	PSO2
24AECE52T.1	3	2	1	2	2	-	-	-	-	-	-	1	3
24AECE52T.2	3	2	2	1	2	-	-	-	-	2	-	1	3
24AECE52T.3	3	2	2	2	2	-	-	-	-	2	-	1	3
24AECE52T.4	3	2	2	2	2	-	-	-	-	2	-	1	3
24AECE52T.5	3	2	3	2	2	-	-	-	-	3	-	2	3



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RAJAMPET, YSR Kadapa District, AP – 516126, INDIA

Title of the Course : Antennas and Wave Propagation
Category : PC
Year : III
Semester : I
Couse Code : 24AECE53T
Branch/es : ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

1. To understand the concepts of antennas and their family.
2. To analyze and design different antennas for various applications.
3. To understand concepts of various wave propagation methods.

Course Outcomes:

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

1. Comprehend and analyze fundamental antenna parameters, radiation mechanisms, antenna field regions, and radiation characteristics of basic antennas such as small dipole, monopole, and half-wave dipole.
2. Design BSA, EFA etc., Antenna arrays. Parasitic arrays and Yagi- Uda antenna.
3. Analyze the construction, radiation characteristics, design considerations, and applications of helical, horn, and reflector antennas.
4. Analyze the propagation of wave and different parameters and Knowledge on all the layers of atmosphere and the nature of different Propagation mechanisms.
5. Explain and analyze space wave and sky wave propagation phenomena including ionospheric layers, critical frequency, MUF, skip distance, and tropospheric effects.

Unit 1 Introduction

14

Introduction, Basic Antenna Parameters, Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity and Gain, Directivity and Resolution, Antenna Apertures, Effective Height, Fields from Oscillating dipole, Antenna Field Zones. Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole – Current Distributions, Evaluation of Field Components, Antenna Theorems – Reciprocity Theorem.

Unit 2 Antenna Arrays

14

Point Source, Arrays of two isotropic point sources-Different cases, non-isotropic point Sources, Principle of Pattern Multiplication, N element Uniform Linear, Arrays Broadside, End fire Arrays, EFA with Increased Directivity, Arrays with Parasitic Elements, Folded Dipoles & their characteristics, Yagi - Uda Arrays.

Unit 3 Antennas and their Characteristics

10

Helical Antennas: Helical Geometry, Helix modes, Horn Antennas – Introduction, Optimum Horns, Rectangular Horn antenna, Reflector Antennas: Flat Sheet and Corner Reflectors. Paraboloidal Reflectors – Geometry, characteristics, Spill Over, Back Lobes, Aperture Blocking.

Unit 4 Ground Wave Propagation

9

Introduction to wave propagation-Definition and Broad Categorization, Classification of Electromagnetic waves based on Modes of propagation, Different modes of Wave Propagation. Ground Wave Propagation– Introduction, Plane earth reflection, Space wave and surface wave, Transition between surface and space

wave, Reduction factor, numerical Distance, Earth's Behavior at different frequencies, Electrical Properties of earth, curved earth reflection.

Unit 5 Space Wave Propagation and Sky Wave Propagation

12

Introduction, Effect of imperfection of Earth, Effects due to - curvature of earth, Shadowing of hills and buildings, Electronics and Communication Engineering 166 Variation of field strength with Height, Super refraction, Scattering Phenomena, Tropospheric propagation, .Structural details of Ionosphere, Wave propagation mechanism, Refraction and reflection of Sky waves by Ionosphere, Ray path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation between MUF and Skip distance, Multi hop propagation, Take-off angle.

Prescribed Textbooks:

1. John D. Kraus, Ronald J. Marhefka and Ahmad S Khan – Antennas and Wave Propagation, TMH, 4e, Special Indian Edition 2010.

Reference Books:

1. K.D. Prasad - Antenna and wave propagation, Khanna Publications.
2. Antenna Theory. - Balanis.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and the World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-long Learning	PS01	PS02
24AECE53T.1	3	3	3	2	-	-	-	-	2	-	-	3	2
24AECE53T.2	2	2	3	2	-	-	-	-	2	-	2	3	2
24AECE53T.3	1	1	3	3	-	1	-	-	-	-	1	3	2
24AECE53T.4	2	2	2	2	-	2	-	-	2	-	2	3	2
24AECE53T.5	2	2	2	2	-	2	-	-	2	-	2	3	2



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RAJAMPET, YSR Kadapa District, AP – 516126, INDIA

Title of the Course : Pulse and Digital Circuits
Category : PE
Year : III
Semester : I
Course Code : 24AECE5AT
Branches : ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

1. To study various wave shaping circuits and their applications
2. To study and acquire knowledge on different circuits that produce non- sinusoidal waveforms.
3. To study various voltage time base generators, Logic gates etc.

Course Outcomes:

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

1. Design and analyze linear and non-linear wave shaping circuits
2. Design and analyze different multivibrator circuits.
3. Identify and differentiate various time base generators.
4. Understand the operation and realization of different sampling gates and logic families.
5. Understand the concepts sampling gates and logic families, Design logic gates using different logic families.

Unit 1 Linear Wave Shaping 12

High pass & low pass RC circuits, their response for sinusoidal, step, pulse, square, ramp and Exponential Inputs. High pass RC network as differentiator, Low pass RC network as integrator, attenuators, ringing circuit.

Unit 2 Switching Characteristics & Non-Linear Wave Shaping 12

Switching Characteristics of Devices: Diode as a switch, Diode Switching Times, Transistor as a Switch, transistor-switching times, Non-Linear Wave Shaping: Diode clippers, Transistor clippers, clipping at two independent levels, Comparators, clamping operation, clamping circuit taking source and diode resistance into account, Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage

Unit 3 Multivibrators 15

Design and analysis of Bi-stable, Monostable & Astable Multivibrator with BJT. Schmitt trigger circuit, Symmetrical & Un Symmetrical Triggering of Bi-stable Multivibrator, Monostable Multivibrator.

Unit 4 Time Base Generators 11

Voltage time base generators: General features of a time base signal, methods of generating time base waveform, Principle and working of Miller and Bootstrap time base generators. Current time base generators: Simple current sweep circuit, linearity correction through driving waveform.

Unit 5 Sampling Gates, Logic Gates and Logic Families 10

Sampling Gates: Basic operation and principle of Sampling gates, uni-directional diode sampling gate, Bi-Directional diode & Transistor sampling gates, four diode sampling gate and their applications. Realization

of AND,OR,NOT gates using diodes and transistors, Inhibit operation, classification of logic families, DTL, RTL, DCTL,TTL, and CMOS logic families, comparison of logic families.

Prescribed Textbooks:

1. J. Millman and H. Taub, Pulse, Digital and Switching Waveforms, McGraw-Hill, second edition, 2007.

Reference Books:

1. Fundamentals of pulse and digital circuits-Ronald j. Tocci, third edition, 2008.
2. Solid state pulse circuits-David A. Bell, 4th Edition, 2002PHI.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and the World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-long Learning	PSO1	PSO2
24AECE5AT.1	3	3	2	3	3	1	-	1	-	-	3	3	2
24AECE5AT.2	3	3	3	3	3	-	-	-	-	-	3	3	2
24AECE5AT.3	3	2	2	2	-	-	-	-	-	-	3	2	2
24AECE5AT.4	3	3	3	3	3	-	-	-	-	-	3	3	1
24AECE5AT.5	3	3	2	3	3	-	-	-	-	-	3	2	3



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RAJAMPET, YSR Kadapa District, AP – 516126, INDIA

Title of the Course : AI and Machine Learning for ICs
Category : PE
Year : III
Semester : I
Couse Code : 24AECE5BT
Branch/es : ECE

Lecture Hours

3

Tutorial Hours

0

Practice Hours

0

Credits

3

Course Objectives:

1. Understand fundamentals of Artificial Intelligence and Machine Learning in the context of VLSI and IC design.
2. Apply ML techniques to IC design automation, optimization, and verification.
3. Analyze data-driven approaches for performance, power, and reliability improvement in ICs.
4. Design AI-assisted solutions for modern semiconductor challenges.
5. Explore emerging trends such as ML-driven EDA and AI accelerators.

Course Outcomes:

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

1. Understand fundamentals of Artificial Intelligence and Machine Learning in the context of VLSI and IC design.
2. Apply ML techniques to IC design automation, optimization, and verification.
3. Analyze data-driven approaches for performance, power, and reliability improvement in ICs.
4. Design AI-assisted solutions for modern semiconductor challenges
5. Explore emerging trends such as ML-driven EDA and AI accelerators.

Unit 1 Introduction to AI & ML for IC Design

12

Artificial Intelligence: definition, scope, and evolution. Fundamentals of Machine Learning. Types of learning: supervised, unsupervised, and reinforcement learning. Role of AI/ML in the semiconductor industry. Overview of IC design flow. Challenges in modern IC design such as scaling, power, and variability. Limitations of conventional IC design methods. Motivation for AI/ML-based IC design automation. Case studies highlighting AI adoption in IC design.

Unit 2 Data Modeling and Feature Engineering for ICs

12

Data sources in IC design including simulation, layout, and process data. Characteristics of IC datasets. Data preprocessing techniques: normalization, noise removal, handling missing values. Feature extraction from circuit parameters and physical design data. Feature scaling techniques. Dimensionality reduction using Principal Component Analysis. Dataset preparation, training-testing split, and validation strategies. Practical considerations in IC data modeling.

Unit 3 Machine Learning Algorithms for IC Applications

12

Regression techniques for IC parameter prediction. Linear and logistic regression for delay, power, and fault analysis. k-Nearest Neighbors and decision tree algorithms. Support Vector Machines for IC classification tasks. Clustering techniques for yield and fault analysis. Model training, validation, and testing. Performance evaluation metrics for IC-related ML problems. Case studies on ML-based yield and performance prediction.

Unit 4 Deep Learning for IC Design and Verification**12**

Introduction to neural networks. Artificial neuron model and learning process. Multilayer perceptron and backpropagation algorithm. Deep learning architectures. Convolutional Neural Networks and their applications in IC layout analysis. Deep learning for defect detection and verification. ML-assisted timing, power, and area optimization. Overview of deep learning-enabled EDA tools and workflows.

Unit 5 Advanced Topics and Case Studies**12**

Reinforcement learning fundamentals and applications. Reinforcement learning for IC floor-planning and placement. AI accelerators and machine learning hardware architectures. ML techniques for yield prediction and reliability analysis. Process variation modeling using ML. Emerging trends in AI-driven IC design. Industrial case studies and future scope of autonomous IC design.

Prescribed Textbooks:

1. Tom M. Mitchell, Machine Learning, McGraw-Hill Education, 1st Edition.
2. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016.

Reference Books:

1. Chris Bishop, Pattern Recognition and Machine Learning, Springer, 1st Edition.
2. Mohammed S. Abdelfattah, Deshanand Singh, Machine Learning for VLSI Design and EDA, Morgan & Claypool Publishers.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and the World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-long Learning	PSO1	PSO2
24AECE5BT.1	3	2	1	1	1	-	-	-	-	-	1	2	1
24AECE5BT.2	3	3	2	1	3	-	-	-	-	-	2	3	2
24AECE5BT.3	2	3	2	2	3	-	-	-	-	-	2	3	2
24AECE5BT.4	2	2	3	2	3	-	-	-	-	-	2	3	3
24AECE5BT.5	2	2	2	2	3	-	-	-	-	-	3	2	3



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RAJAMPET, YSR Kadapa District, AP – 516126, INDIA

Title of the Course : Control Systems
Category : PE
Year : III
Semester : I
Course Code : 24AECE5CT
Branch/es : ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

1. Describe the basic principles and applications of control systems.
2. Explain and analyze the time response and steady-state response of control systems
3. Apply time-domain analysis techniques to obtain solutions for linear time-invariant systems.
4. Analyze and evaluate system stability using frequency-domain methods
5. Explain the concepts of state-space representation, controllability, and observability, and analyze their significance in system design

Course Outcomes:

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

1. Apply fundamental principles of control systems to model systems using appropriate mathematical representations
2. Analyze the time-response characteristics of control systems to evaluate transient and steady-state behavior.
3. Analyze system stability using standard stability analysis techniques
4. Construct and analyze frequency-domain plots such as Bode plots, Polar plots, and Nyquist plots for control system analysis
5. Evaluate control systems using state-space methods with respect to stability, controllability, and observability.

Unit 1 Basic Concepts of Control Systems and Transfer Function Modeling 12

Basic control system components, Classification- Open Loop and closed loop control systems and their differences, Feedback principle, Effect of feedback, Mathematical models. Transfer function-Block Diagram representation, Signal Flow graph and Mason's gain formula

Unit 2 Transient and steady-state analysis of LTI systems 12

Types of test signals, Type and Order of system, Time Response of first order system and second order system, Time domain specifications, Static error constants. Steady state error, Basics of P, PI, PD and PID controllers

Unit 3 Stability analysis in Time domain 12

Routh-Hurwitz stability criterion, Root locus concept and Construction of root loci, Effects of adding poles and zeros to $G(s)$ $H(s)$ on the root loci.

Unit 4 Stability analysis in Frequency domain 12

Frequency domain specifications, Stability Analysis from Bode Plots. Polar Plots, Nyquist stability criterion- simple problems, Introduction to compensators- Lag, Lead and Lag-Lead.

Unit 5 State Space Analysis**12**

Concepts of state, state variables and state Space Model, Solution of state equations of LTI systems
State transition Matrix and its properties ,Concepts of controllability and observability

Prescribed Textbooks:

1. J. Nagrath and M. Gopal, *Control Systems Engineering*, 8th edition, New Age International (P) Limited, Publishers

Reference Books:

1. A. Nagoor Kani, *Control Systems*, 3rd Edition, RBA Publications
2. Katsuhiko Ogata, *Modern Control Engineering*, 3rd edition, Prentice Hall of India Pvt. Ltd., 1998.
3. A. Anand Kumar, *control systems*, Eastern Economy edition, PHI learning private Ltd, 2011.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and the World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-long Learning	PSO1	PSO2
24AECE5CT.1	3	3	2	1	2	-	-	-	-	-	-	2	2
24AECE5CT.2	3	3	2	2	2	-	-	-	-	-	-	2	2
24AECE5CT.3	3	3	3	2	2	-	-	-	-	-	-	2	2
24AECE5CT.4	3	3	3	2	3	-	-	-	-	-	-	2	2
24AECE5CT.5	3	3	3	2	3	-	-	-	-	-	-	2	2



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RAJAMPET, YSR Kadapa District, AP – 516126, INDIA

Title of the Course : Internet of Things
Category : PE
Year : III
Semester : I
Couse Code : 24AECE5DT
Branch/es : ECE

Lecture Hours

3

Tutorial Hours

0

Practice Hours

0

Credits

3

Course Objectives:

1. To introduce the fundamentals, evolution, architecture, and enabling technologies of the Internet of Things (IoT).
2. To explain various IoT application domains and real-world case studies including smart homes, smart cities, environment, energy, agriculture, industry, and healthcare.
3. To describe the concepts of IoT and Machine-to-Machine (M2M) communication, highlighting their differences and the role of SDN and NFV in IoT systems.
4. To develop logical IoT system designs using Python programming, covering data structures, control flow, modular programming, and file handling.
5. To provide hands-on knowledge of IoT physical devices and endpoints, with emphasis on Raspberry Pi architecture, interfaces, and Python-based programming.

Course Outcomes:

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

1. Explain the vision of the Internet of Things (IoT) from a global perspective.
2. Evaluate IoT applications in healthcare, health monitoring, and lifestyle enhancement systems.
3. Identify the differences between IoT and M2M (Machine-to-Machine) communication
4. Create IoT-based experiments with the help of Python programming.
5. Design and develop IoT applications using a Raspberry Pi kit.

Unit 1 Introduction to Internet of Things

10

Introduction to Internet of Things, History of IoT, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, IoT Levels & Deployment Templates, Applications of IoT.

Unit 2 IoT Applications and Case Studies

10

Introduction, Home Automation, Cities, Environment, Energy, Retail, Agriculture, Industry, Health & Lifestyle

Unit 3 IoT and M2M & IoT Platforms Design Methodology

10

IoT and M2M: Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT. IoT Platforms Design Methodology: Introduction, IoT Design Methodology.

Unit 4 IoT Systems-Logical Design Using Python

10

Introduction, Installing Python, Python Data Types and Data Structures, Control Flow, Functions, Modules, Packages and File Handling.

Unit 5 IoT Physical Devices and Endpoints

11

What is an IoT Device, Exemplary Device: Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces, Programming Raspberry Pi with Python, Other IoT Devices.

Prescribed Textbooks:

1. Internet of Things, A Hands-On Approach, Arshdeep Bahga, Vijay Madisetti, University Press, 2014

Reference Books:

1. The Internet of Things Connecting Objects to the Web, Hakima Chaouchi, Wiley publications, 2010
2. Designing the Internet of Things, Adrian McEwen, Hakim Cassimally, Wiley 2014.
3. Enterprise IoT, A Definitive Handbook by Naveen Balani.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and the World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-long Learning	PSO1	PSO2
24AECE5DT.1	2	1	1	2	1	-	-	-	-	-	1	1	-
24AECE5DT.2	2	2	1	2	2	-	-	-	-	-	1	2	1
24AECE5DT.3	2	2	1	2	1	-	-	-	-	-	1	1	-
24AECE5DT.4	1	2	3	2	3	-	-	-	-	-	2	3	2
24AECE5DT.5	1	2	3	2	3	-	-	-	-	-	2	3	3



ANNAMACHARYA UNIVERSITY

(ESTD UNDER AP PRIVATE UNIVERSITIES (ESTABLISHMENT AND REGULATION) ACT, 2016)
(UNIVERSITY LISTED IN UGC AS PER THE SECTION 2(f) OF THE UGC ACT, 1956)

RAJAMPET, YSR Kadapa District, AP – 516126, INDIA

Title of the Course : Quantum Technology for Electronics Engineers
Category : PE
Year : III
Semester : I
Couse Code : 24AECE5ET
Branch/es : ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

1. Introduce the fundamental principles of quantum mechanics and quantum technology.
2. Provide knowledge of quantum bits, quantum gates, and quantum circuits for processing.
3. Familiarize students with important quantum algorithms and highlight their computational advantages over classical algorithms.
4. Explain various physical realizations and implementation requirements of quantum computers.
5. Expose students to applications of quantum computing in communication, information processing, and emerging technologies.

Course Outcomes:

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

1. Comprehend the fundamental concepts of quantum technology.
2. Analyze basic quantum gates and quantum circuits using single and multiple qubits.
3. Interpret standard quantum algorithms and evaluate their advantages over classical approaches.
4. Describe physical realizations and implementation requirements of quantum computers.
5. Comprehend various applications of quantum computing.

Unit 1 Introduction to Quantum Technology

09

Introduction to Quantum Technology, Bits to Qubits, Power of Quantum Computing, How Quantum Physics Differs from Classical Physics, Concepts of Quantum Mechanics, Quantum Bits and Multiple Qubits.

Unit 2 Quantum Gates and Circuits

12

Basic ideas of Single Qubit Gates: Quantum NOT Gate, Z Gate, Hadamard Gate, Phase gate, Multiple Qubit Gates : Controlled NOT Gate, Swap gate, Controlled Z Gate, Toffoli Gate, Qubit coping circuit, Quantum Half-Adder and Subtractor.

Unit 3 Quantum Computing Algorithms

12

Shor's Algorithm, Quantum Fourier Transform and implementation using quantum gates(overview), Phase estimation, Steps in Grover's search Algorithm, Utility of the Quantum Search algorithm over classical Databases.

Unit 4 Physical realization of Quantum computers

10

Basic requirement for quantum computation, Harmonic Oscillator Quantum computer, Optical photon Quantum computer, Ion Traps, Nuclear Magnetic Resonance, Silicon quantum computer

Unit 5 Applications of Quantum Computing

09

Quantum Teleportation, Quantum Parallelism, Superdense Coding, Quantum Communication, Advantages of quantum communication

Prescribed Textbooks:

1. Vishal Sahni, Quantum Computing, Tata McGraw Hill Education Private Limited, First Edition, 2010.

Reference Books:

1. Michael A. Nielsen, Isaac L. Chuang, *Quantum Computation and Quantum Information*, Cambridge University Press, 10th Edition, 2010
2. Eleanor Rieffel and Wolfgang Polak, *Quantum Computing A Gentle Introduction*, MIT Press, 2011
3. Chris Bernhardt, *Quantum Computing for Everyone*, MIT Press, 2019.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and the World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-long Learning	PSO1	PSO2
24AECE5ET.1	2	2	1	1	-	2	-	-	1	-	2	2	-
24AECE5ET.2	3	3	2	2	-	3	-	-	2	-	3	3	-
24AECE5ET.3	2	2	1	1	-	2	-	-	1	-	2	2	-
24AECE5ET.4	2	2	1	1	-	2	-	-	1	-	2	2	-
24AECE5ET.5	2	2	1	1	-	2	-	-	1	-	2	2	-



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RAJAMPET, YSR Kadapa District, AP – 516126, INDIA

Title of the Course : VLSI Design Lab
 Category : PC
 Year : III
 Semester : I
 Course Code : 24AECE51L
 Branch/es : ECE

Lecture Hours

0

Tutorial Hours

0

Practice Hours

2

Credits

1

Course Objectives:

1. To Comprehend the programming language Constructs in Verilog.
2. To write the verilog code for different logic Circuits
3. To observe the functionality of logic Circuits through output waveforms generated.

Course Outcomes:

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

1. Comprehend the digital circuits design using Verilog HDL.
2. Write the Verilog code for different logic Circuits.
3. Observe the functionality of logic Circuits through output waveforms generated.

LIST OF EXPERIMENTS: (Execute any 10 experiments)

1. Design of CMOS gates
2. Design of Adder Circuits
3. Design of Multiplexers
4. Design of Demultiplexers
5. Design of Encoders
6. Design of Decoders
7. Design of Flip-Flops
8. Design of ALU.
9. Design of Synchronous Counters.
10. Design of 1-bit RAM Cell.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and the World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-long Learning	PSO1	PSO2
24AECE51L.1	2	3	2	2	2	2	-	2	2	-	-	2	2
24AECE51L.2	2	3	2	2	3	-	-	2	2	-	-	2	2
24AECE51L.3	2	3	2	2	3	-	-	2	2	-	-	2	2



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RAJAMPET, YSR Kadapa District, AP – 516126, INDIA

Title of the Course :	Microprocessors and Microcontrollers Lab
Category :	PC
Year :	III
Semester :	I
Course Code :	24AECE52L
Branch/es :	ECE

Lecture Hours

0

Tutorial Hours

0

Practice Hours

3

Credits

1.5

Course Objectives:

1. To become skilled in 8086 Assembly Language programming.
2. To understand the detailed software and hardware structure of the microprocessor.
3. Train their practical knowledge through laboratory experiments.
4. To understand and learn 8051 Microcontroller.
5. To acquire knowledge on microprocessors and microcontrollers, interfacing various peripherals, and configuring.

Course Outcomes:

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

1. Formulate a program and implement algorithms using Assembly language.
2. Describe an Assembly language program for the 8086 Microprocessor.
3. Develop programs for different applications in the 8086 Microprocessor
4. Interface peripheral devices with 8086.
5. Describe an Assembly language program for the 8051 Microcontroller.

LIST OF EXPERIMENTS: (Minimum 10 experiments to be performed)

8086 Microprocessor

1. Unsigned Arithmetic operations.
2. Signed Arithmetic operations.
3. ASCII – Arithmetic operations.
4. Addition of two BCD numbers (4-digit each).
5. Code conversion.
6. Identify the parity (even/Odd) of a given byte/word.
7. String Operations:
 - a. Relocate a string of N words/bytes.
 - b. Reverse String.
 - c. Length of the String.
 - d. String Insertion.
 - e. String Deletion.
 - f. Scanning a byte/ word.
8. LED/Seven Segment Display Interfacing.
9. DAC Interfacing.
10. Stepper Motor Interfacing.

8051 Microcontroller

11. Arithmetic operations:
 - a) Addition and Subtraction.
 - b) Multiplication and Division.
12. Programs related to Register banks.
13. Reading from and Writing to a port of 8051.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and the World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-long Learning	PSO1	PSO2
24AECE52L.1	2	3	2	2	2	-	-	-	-	-	-	2	2
24AECE52L.2	2	3	2	2	3	-	-	2	-	-	-	2	1
24AECE52L.3	2	3	2	2	3	-	-	2	-	-	-	2	2
24AECE52L.4	2	3	1	2	3	-	-	-	-	-	-	2	1
24AECE52L.5	2	3	3	2	3	-	-	2	-	-	-	2	2



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RAJAMPET, YSR Kadapa District, AP – 516126, INDIA

Title of the Course : Embedded Systems
Category : PC
Year : III
Semester : II
Couse Code : 24AECE61T
Branch/es : ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

1. To provide basic concepts, architecture, and applications of embedded systems.
2. To analyze hardware, software, development process, and communication interfaces of embedded systems

Course Outcomes:

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

1. Understand the concepts, architecture, classifications, applications of embedded systems.
2. Analyze embedded system hardware architecture and platforms, including microcontroller-based systems.
3. Understand software architecture and basic principles of real-time operating systems used in embedded systems.
4. Analyze the embedded system development process.
5. Analyze and select appropriate communication interfaces for embedded system applications.

Unit 1 INTRODUCTION TO EMBEDDED SYSTEMS 10

Embedded System – Definition, Application Areas, Categories, Overview of Embedded System Architecture, Specialties, Recent trends.

Unit 2 HARDWARE ARCHITECTURE & PLATFORMS 12

Hardware Architecture – CPU, Memory, Clock Circuitry, Watch dog Timer/Reset Circuitry, chip select, I/O devices, Debug Port, Communication Interfaces, Power supply, types of hardware platforms, 89c51 Micro-controller development board.

Unit 3 SOFTWARE ARCHITECTURE 10

Software Architecture – Services provided by an operating System, Architecture and categories of Embedded Operating Systems, Application Software, Communication software, Process of generating Executable image, Development/Testing tools.

Unit 4 THE PROCESS OF EMBEDDED SYSTEM DEVELOPMENT 10

The Development Process, Requirements Engineering, Design: Design Tradeoffs ,Co-design, Hardware Design, software Design, Implementation, Integration and testing.

Unit 5 COMMUNICATION INTERFACES**10**

Need for Communication interface, RS232/UART, RS 422/RS 485, USB, Infrared, IEEE 1394 fire wire, IEEE 802.11, Bluetooth, I2C.

Prescribed Textbooks:

1. Embedded/ Real Time Systems, K.V.K.K. Prasad, Dream tech press.

Reference Books:

1. Embedded Systems, Raj Kamal, TMH. 2nd edition.2008.,Pearson Ed.,2005
2. An Embedded system Primer-David E.Simon.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and the World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-long Learning	PSO1	PSO2
24AECE61T.1	3	2	1	1	-	-	-	-	-	-	2	2	1
24AECE61T.2	3	3	2	1	2	-	-	-	-	-	1	3	2
24AECE61T.3	3	2	1	1	2	-	-	-	-	-	2	2	1
24AECE61T.4	2	3	3	2	2	-	-	2	1	2	2	3	2
24AECE61T.5	2	3	2	2	3	1	-	-	1	-	2	2	3



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RAJAMPET, YSR Kadapa District, AP – 516126, INDIA

Title of the Course : Microwave Engineering
Category : PC
Year : III
Semester : II
Couse Code : 24AECE62T
Branch/es : ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

1. To provide a strong foundation in microwave frequency electromagnetic wave theory, waveguides, and modes of propagation for engineering applications.
2. To familiarize students with microwave components, devices, and sources, including waveguide junctions, ferrite devices, microwave tubes, and solid-state devices.
3. To develop the ability to analyze and measure microwave system parameters.

Course Outcomes:

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

1. Comprehend the microwave frequency range, its applications, and Explain wave propagation, TE/TM modes, cutoff frequency, and field patterns in rectangular waveguides.
2. Analyze TE and TM mode propagation in circular waveguides and comprehend the working, resonant frequency, and Q-factor of cavity resonators.
3. Apply S-matrix concepts to analyze microwave junctions and explain the working of passive microwave components and ferrite devices.
4. Explain and comprehend the construction, working principles, and performance characteristics of microwave tubes such as klystrons, TWTs, and magnetrons.
5. Comprehend and explain the operation of solid-state microwave devices and perform microwave measurements using standard techniques.

Unit 1 Introduction to Microwave Engineering & Wave Guides: Rectangular Waveguides 14

Introduction to Microwave engineering, Microwave Spectrum and Bands, Advantages & Applications of Microwaves. Wave guides- Types, Rectangular Waveguides – TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes. Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations, Impossibility of TEM mode

Unit 2 Circular Waveguides 10

Propagation of TE & TM waves, Nature of Fields, Characteristic Equation, TM modes, Dominant and Degenerate Modes, Attenuation, Advantages and Applications. Cavity Resonators– Introduction, Rectangular and Cylindrical Cavities, Dominant Modes and Resonant Frequencies, Q factor and Coupling Coefficients.

Unit 3 Microwave Components 12

Waveguide Microwave Junctions Formulation and Properties of S-Matrix, Microwave T-Junctions-H-Plane, E-Plane, Magic Tee and its Applications. Directional Couplers-Two Hole, Wave guide Irises- Posts & Tuning

screws, Coupling Probes and loops, Waveguide Terminations, Phase Shifters and Microwave attenuators, Ferrite Devices Faraday Rotation Microwave devices- Gyrator, Isolator, Circulator

Unit 4 Microwave Sources-Klystrons, TWT's, Magnetrons

14

Limitations and Losses of conventional tubes, Microwave tubes– classifications, Two Cavity Klystrons – Structure, Reentrant Cavities, Velocity Modulation Process and Applegate Diagram, Bunching Process, Expressions for output Power and Efficiency. Reflex Klystrons – Structure, Applegate Diagram and Principle of working, Mathematical Theory of Bunching, Power Output, Efficiency, Electronic Admittance. TWT's- Construction, Principle and working Operation, Mathematical Analysis, Performance and Applications. Magnetron-Introduction, Cavity Magnetron, Mathematical Analysis, Sustained oscillations, Mode jumping, Frequency Pushing and pulling, Performance Characteristics and Applications

Unit 5 Microwave Solid State Devices & Measurements

10

Introduction, TED's, Gunn Effect Diodes (GaAs), RWH Theory-Differential Negative Resistance, Two Valley Model Theory, Modes of Operation. Avalanche Transit Time devices- Introduction, IMPATT and TRAPATT Diodes-Structure, Principle of Operation, Power output and Efficiency. Microwave Measurements-Description of Microwave Bench–Different Blocks and their Features, Precautions; Microwave Power Measurement – Bolometer Method. Measurement of Attenuation, Frequency, VSWR, Cavity Q, Impedance Measurements.

Prescribed Textbooks:

1. Samuel Y. Liao, PHI- Microwave Devices and Circuits, 3rd Edition, 2003

Reference Books:

1. Microwave and Radar Engineering, M Kulkarni– Umesh Publications, 1998
2. R.E. Collin - Foundations for Microwave Engineering, IECE Press, John Wiley, 2nd Edition, 2002
3. Herbert J. Reich, J.G. Skolnik, P.F. Ordung and H.L. Krauss - Microwave Principles, CBS Publishers and Distributors, New Delhi, 2004.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and the World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-long Learning	PSO1	PSO2
24AECE62T.1	3	2	1	1	–	–	–	–	–	–	1	2	–
24AECE62T.2	3	3	1	2	–	–	–	–	–	–	1	2	–
24AECE62T.3	3	3	2	1	–	–	–	–	–	–	1	3	–
24AECE62T.4	3	2	1	1	–	–	–	–	–	–	1	2	–
24AECE62T.5	3	2	2	3	2	–	–	–	–	–	1	2	2



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RAJAMPET, YSR Kadapa District, AP – 516126, INDIA

Title of the Course : Digital Signal Processing
Category : PC
Year : III
Semester : II
Couse Code : 24AECE63T
Branch/es : ECE

Lecture Hours

3

Tutorial Hours

0

Practice Hours

0

Credits

3

Course Objectives:

1. Comprehend fundamentals of discrete-time signals and systems.
2. Analyze signals using Fourier and FFT techniques.
3. Design and implement digital filters.
4. Apply multirate DSP concepts and applications.

Course Outcomes:

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

1. Analyze discrete-time signals and LTI systems using DFT concepts.
2. Compute DFT efficiently using Radix-2 FFT algorithms.
3. Design and realize IIR and FIR digital filters
4. Apply multirate DSP techniques for sampling rate conversion
5. Apply DSP techniques to real-world signal processing applications. Understand different number systems conversions & Binary codes

Unit 1 Introduction and Discrete Fourier Series

12

Discrete time signals, LTI systems, stability and causality, Solution of linear constant coefficient difference equations. Z-Transform: Definition, ROC, Properties, Poles and Zeros in Z-plane, the inverse Z-Transform, System analysis, Transfer function. Properties of discrete Fourier series.

Unit 2 Fast Fourier Transforms

12

Discrete Fourier transforms: properties of DFT, linear convolution of sequences using DFT, computation of DFT. Fast Fourier transforms (FFT)-Radix2 decimation in time and decimation in frequency FFT algorithms, inverse FFT.

Unit 3 IIR and FIR Digital Filters

12

Introduction to digital filters, Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters by Impulse invariant and bilinear transformation methods, Basic structures of IIR Filters - Direct form-I, Direct form-II, Cascade form and Parallel form realizations. Design of FIR filters using windowing methods (Rectangular, Triangular, Raised Cosine, Hanning, Hamming, Blackman), Basic structures of FIR Filters – Direct form, Cascade form, Comparison of IIR & FIR filters.

Unit 4 Multirate Digital Signal Processing Fundamentals

12

Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Filter Design and Implementation for Sampling rate conversion, Multistage implementation of Sampling rate conversion.

Unit 5 Applications of Digital Signal Processing**12**

Spectral analysis of non-stationary Signals, Musical Sound processing, Signal Compression, Oversampling A/D Converter, Oversampling D/A Converter.

Prescribed Textbooks:

1. Digital Signal Processing, A computer base approach- Sanjit K Mitra, Tata McGraw Hill, 3rd edition, 2009

Reference Books:

1. Discrete Time Signal Processing-A.V. Oppenheim and R.W. Schaffer, 2nd ed., PHI.
2. Digital Signal Processing- P. Ramesh Babu, 4th Ed. SciTech Publications

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and the World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-long Learning	PSO1	PSO2
24AECE63T.1	2	3	2	2	-	2	-	-	2	-	2	3	-
24AECE63T.2	2	3	2	2	-	2	-	-	2	-	2	2	-
24AECE63T.3	2	3	3	2	-	2	-	-	2	-	2	2	2
24AECE63T.4	2	2	2	2	-	2	-	-	2	-	2	2	2
24AECE63T.5	2	2	2	2	-	2	-	-	2	-	2	-	-



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RAJAMPET, YSR Kadapa District, AP – 516126, INDIA

Title of the Course: Electronic Measurements and Instrumentation
Category : PE
Year : III
Semester : II
Couse Code : 24AECE6AT
Branch/es : ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

1. Give the knowledge on instrument usage for a particular application.
2. Explain the internal structure of all instruments that are used in measuring parameters related to electronic based systems
3. To study and apply modern measurement techniques and transducers

Course Outcomes:

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

1. State the principles of measurements with different basic meters and calculate all the parameters related to measurements.
2. Describe different types of signal generators and Signal analyzers.
3. Explain the basic features of oscilloscope, its internal architecture and different types
4. Design different types of bridges for signal conditioning purpose.
5. Comprehend about different types of transducers and advancements in Instrumentation.

Unit 1 Measurement Systems and Electrical Measuring Instruments 12

Generalized measurement system, Accuracy, Precision, Resolution. Errors in Measurement. Basics of statistical analysis, D'Arsonval galvanometer, PMMC mechanism. DC Ammeter. DC voltmeter. Series Ohmmeter, shunt Ohmmeter. Volt-Ohm-Milli ammeter. Digital voltmeters (DVMs): Ramp type & dual slope integrator, Digital Multimeter

Unit 2 Signal Generators & Analyzers 10

Audio frequency signal generation, Sine-wave generator, frequency-Synthesized signal generator, frequency divider generator, signal generator modulation, Sweep frequency generator, pulse and square wave generators. Function generator. Wave analyzers, Harmonic distortion analyzers, Spectrum Analyzers. Simple Frequency counter.

Unit 3 Oscilloscopes and Waveform Analysis 12

Oscilloscope block diagram, Cathode Ray Tube, deflection amplifiers, oscilloscope time base, dual trace oscilloscope, and oscilloscope controls. Measurement of voltage, frequency and phase. display of device characteristics, X-Y and Z displays, Sampling Oscilloscopes, Digital Storage Oscilloscope (DSO): Architecture and memory systems, Advanced triggering techniques, Signal integrity issues in oscilloscope measurements, Applications of DSO in mixed-signal measurements, Oscilloscope specifications and performance.

Unit 4 Review of DC Bridges 9

Wheatstone bridge, guarded Wheatstone bridge, Kelvin Bridge, AC bridges and their application, Maxwell's bridge, Hays Bridge. Schering Bridge. Wein Bridge. Q-meter.

Unit 5 Transducers and Sensors**8**

Active and passive transducers-Measurement of displacement (Resistance, capacitance, inductance; LVDT) Force (strain gauges) Pressure (piezoelectric transducers) -Temperature (resistance thermometers, thermocouples, and thermistors)- Velocity- Acceleration-Vibration.

Prescribed Textbooks:

1. Electronic Instrumentation and Measurements, Third edition – David A. Bell, Eastern Economy Edition, PHI, 2013.

Reference Books:

1. Electronic instrumentation, Third edition - H.S. Kalsi, Tata McGraw Hill, 2018
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PEARSON Education
3. A course in electrical and electronic measurements and instrumentation. A.K. Sawhney., Dhanat Rai& Co publishers.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and the World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-long Learning	PSO1	PSO2
24AECE6AT.1	3	3	2	3	3	-	-	-	-	-	3	3	3
24AECE6AT.2	3	3	2	3	3	-	-	-	-	-	3	3	3
24AECE6AT.3	3	2	1	2	3	-	-	-	-	-	2	3	2
24AECE6AT.4	3	3	2	3	3	-	-	-	-	-	3	3	3
24AECE6AT.5	3	3	2	3	3	-	-	-	-	-	3	3	3



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RAJAMPET, YSR Kadapa District, AP – 516126, INDIA

Title of the Course : Digital System Design
Category : PE
Year : III
Semester : II
Course Code : 24AECE6BT
Branch/es : ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

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

1. Understand the fundamentals of digital system design using ASM charts, HDL, and state tables.
2. Design and analyze synchronous sequential circuits using ROMs and PLAs.
3. Analyze fault models and apply test generation techniques for combinational circuits.
4. Design fault diagnosis experiments for sequential circuits and PLAs.
5. Analyze asynchronous sequential machines and identify hazards and races.

Course Outcomes:

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

1. Explain ASM charts, HDL descriptions, state tables, and state reduction techniques.
2. Design synchronous sequential circuits using ROMs, PLAs, and iterative logic structures.
3. Analyze digital circuits for different fault models and generate tests using standard fault detection algorithms.
4. Design and evaluate fault detection and diagnosis experiments for sequential circuits and PLAs.
5. Analyze asynchronous sequential machines and identify hazards, races, and stable states.

Unit 1 Design of Digital Systems and Sequential Circuit 12

ASM charts, Hardware description language and control sequence method, Reduction of state tables, state assignments, design of Iterative circuits, design of sequential circuits using ROMs and PLAs.

Unit 2 Fault Modeling and Test Generation Algorithms 12

Fault classes and models – Stuck at faults, bridging faults, transition and intermittent faults. Fault diagnosis of Combinational circuits by conventional methods – Path Sensitization technique, Boolean difference method, Kohavi algorithm. D – Algorithm, PODEM, Random testing, transition count testing, Signature analysis and testing for bridging faults

Unit 3 Fault Diagnosis In Sequential Circuits 12

State identification and fault detection experiment. Machine identification, Design of fault detection experiment

Unit 4 Programming Logic Arrays & Testing 12

Design using PLA's, PLA minimization and PLA folding. Fault models, Test generation and Testable PLA design.

Unit 5 Asynchronous Sequential Machine 12

Fundamental mode model, flow table, state reduction, minimal closed covers, races, cycles and hazards.

Prescribed Textbooks:

1. Z. Kohavi – “Switching & finite Automata Theory” (TMH)

Reference Books:

1. M. Abramovici, M. A. Breues, A. D. Friedman – “Digital System Testing and Testable Design”, Jaico Publications
2. Charles H. Roth Jr. – “Fundamentals of Logic Design”.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and the World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-long Learning	PSO1	PSO2
24AECE6BT.1	3	2	1	1	1	-	-	-	-	-	-	3	-
24AECE6BT.2	3	2	3	1	2	-	-	-	-	-	-	2	3
24AECE6BT.3	2	3	1	3	2	-	-	-	-	-	-	-	2
24AECE6BT.4	2	3	2	3	2	-	-	-	-	-	-	1	3
24AECE6BT.5	2	3	1	2	-	-	-	-	-	-	1	-	-



ANNAMACHARYA UNIVERSITY

(ESTD UNDER AP PRIVATE UNIVERSITIES (ESTABLISHMENT AND REGULATION) ACT, 2016)
(UNIVERSITY LISTED IN UGC AS PER THE SECTION 2(f) OF THE UGC ACT, 1956)

RAJAMPET, YSR Kadapa District, AP – 516126, INDIA

Title of the Course : Radar Engineering
Category : PE
Year : III
Semester : II
Course Code : 24AECE6CT
Branch/es : ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

1. To learn the fundamental operation and working principles of modern radar systems.
2. To comprehend the basic concepts of modern radar systems for both civilian and defense applications.
3. To learn various signal detection techniques, displays and duplexers used in radar systems

Course Outcomes:

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

1. Comprehend the essential principles of operation and fundamentals of radar systems
2. Gain in-depth knowledge about the different types of RADARS.
3. Identify the various RADAR systems in existence, their applications and limitations
4. Comprehend the need for various signal detection techniques in RADAR systems.
5. Know the various technologies used in the design of RADAR systems such as duplexers, displays etc..

Unit 1 Radar Principles 12

Introduction, The simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies, Applications of radar, Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Signal-to-noise Ratio, Integration of Radar Pulses, Radar Cross Section of Targets (sphere, cone-sphere)

Unit 2 CW and Frequency Modulated Radar 9

Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Applications of CW radar, FM-CW Radar-Range and Doppler Measurement, Block Diagram, FM-CW altimeter.

Unit 3 MTI and Pulse Doppler Radar 10

Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, Range Gated Doppler Filters.

Unit 4 Tracking Radar 10

Tracking with Radar, Sequential lobing, Conical Scan, Monopulse Tracking Radar – Amplitude Comparison Monopulse (one coordinates), Phase Comparison Monopulse, Comparison of Trackers.

Unit 5 Detection of Radar Signals in Noise**10**

Noise Figure, Noise figure of networks in cascade, Noise Temperature, Radar Displays – types, Duplexers – Branch type and Balanced type.

Prescribed Textbooks:

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

Reference Books:

1. Radar Principles – Peebles, Jr., P.Z.Wiley, New York, 1998

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and the World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-long Learning	PSO1	PSO2
24AECE6CT. 1	1	3	3	1	-	-	2	-	1	2	3	2	-
24AECE6CT. 2	1	3	3	2	-	2	2	-	-	2	3	2	2
24AECE6CT. 3	1	3	3	3	-	2	2	-	-	3	3	1	-
24AECE6CT. 4	1	3	3	3	-	2	2	-	-	2	3	-	1
24AECE6CT. 5	1	3	3	2	1	-	2	-	-	2	3	1	-



ANNAMACHARYA UNIVERSITY

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RAJAMPET, YSR Kadapa District, AP – 516126, INDIA

Title of the Course : Introduction to Deep Learning
Category : PE
Year : III
Semester : II
Couse Code : 24AECE6DT
Branch/es : ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

1. Comprehend the basics of machine learning techniques.
2. Describe the designing model of deep feed forward networks
3. Implement efficient convolution algorithms
4. Comprehend various deep learning models such CNN, Autoencoders, RNN.
5. Apply the deep learning methods in real time applications

Course Outcomes:

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

1. Introduce students through some of the latest techniques in deep learning
2. Comprehend the internal designing of deep feed forward network and learning
3. Recognize convolution and recurrent neural networks.
4. Comprehend and apply different recurrent neural networks.
5. Hands on and the students should be able to design intelligent deep learning systems for solving the problems in the areas of their interests

Unit 1 Introduction 10

Machine Learning Basics: Learning algorithms, supervised and unsupervised, building a machine learning algorithm, and challenges motivating deep learning.

Unit 2 Regularization for Deep Learning 12

Regularization and Under Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multitask Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Optimization for Training Deep Models challenges in Neural Network Optimization, Basic Algorithms, Optimization Strategies and Meta-Algorithms

Unit 3 Convolutional Networks 11

The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, The Neuro-scientific Basis for Convolutional Networks, Convolutional Networks and the History of Deep Learning.

Unit 4 Sequence Modelling 10

Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks. Long short-term memory

Unit 5 Deep Generative models**12**

Deep Belief Networks, Variational Autoencoders, Generative Adversarial Networks, Deep Convolutional GAN Applications: Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing, Other Applications

Prescribed Textbooks:

1. Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning (Adaptive Computation and Machine Learning series), MIT Press

Reference Books:

1. Li Deng and Dong Yu, Deep Learning Methods and Applications, Foundations and Trends in Signal Processing Volume 7 Issues 3-4, ISSN: 1932-8346
2. Dr. N.D. Lewis, Deep Learning Made Easy with R A Gentle Introduction for Data Science. Create Space Independent Publishing Platform
3. François Chollet, JJ Allaire, MEAP Edition Manning Early Access Program Deep Learning with R Version 1, Copyright 2017 Manning Publications.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and the World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-long Learning	PSO1	PSO2
24AECE6DT.1	3	3	3	3	-	-	-	-	-	-	-	2	3
24AECE6DT.2	3	2	3	2	-	-	-	-	-	-	-	-	3
24AECE6DT.3	3	3	2	3	-	-	-	-	-	-	-	3	2
24AECE6DT.4	3	2	2	2	-	-	-	-	-	-	-	2	-
24AECE6DT.5	2	3	3	3	3	-	-	-	-	-	-	3	3



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RAJAMPET, YSR Kadapa District, AP – 516126, INDIA

Title of the Course : Biomedical signal processing
Category : PE
Year : III
Semester : II
Couse Code : 24AECE6ET
Branch/es : ECE

Lecture Hours

3

Tutorial Hours

0

Practice Hours

0

Credits

3

Course Objectives:

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

1. Understand the origin and types of biomedical signals.
2. Study acquisition systems and electrodes used in biomedical instrumentation.
3. Apply transform techniques for biomedical signal analysis.
4. Analyze biomedical signals using dimensionality reduction techniques.
5. Apply pattern recognition techniques for biomedical signal classification.

Course Outcomes:

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

1. Explain different types and characteristics of biomedical signals. (L2)
2. Analyze biomedical signal acquisition systems and electrode characteristics. (L2)
3. Apply Fourier and wavelet transform techniques for biomedical signal analysis. (L4)
4. Analyze biomedical signals using PCA, ICA and other orthogonal transformations. (L4)
5. Classify biomedical signals using supervised and unsupervised learning methods. (L3)

Unit 1 Introduction to Biomedical Signal Processing

12

Introduction – Acquisition and generation of bio-signals – Origin of bio-signals – Types of bio-signals – Study of diagnostically significant bio-signal parameters – Action potential – Important epochs of ECG and EEG – Objectives of biomedical signal processing.

Unit 2 Electrodes and Signal Conditioning

12

Electrode–electrolyte interface – Polarization – Electrode-skin interface and motion artefacts – Biomaterials used for electrodes – Types of electrodes (body surface, internal, electrode arrays, microelectrodes) – Practical aspects of electrode usage – Acquisition of bio-signals – Signal conditioning – ADCs and DACs – Processing considerations.

Unit 3 Transform Techniques

12

Biomedical signal processing using Fourier analysis – Spectral analysis of deterministic and stationary random signals – Non-stationary signal analysis – Time-frequency analysis – Wavelet transform – Computation of diagnostically significant parameters – Classification of signals and noise.

Unit 4 Dimensionality Reduction Techniques

12

Principal Component Analysis (PCA) – Correlation and regression – Analysis of chaotic signals – Multiresolution analysis (MRA) – Wavelets – Independent Component Analysis (ICA) – Noise separation techniques in biomedical signals.

Unit 5 Pattern Classification**12**

Supervised and unsupervised classification – Neural Networks – Support Vector Machines (SVM) – Hidden Markov Models (HMM) – Applications in biomedical signal diagnosis and decision systems.

Prescribed Textbooks:

1. R.M. Rangayyan, Biomedical Signal Analysis: A Case Study Approach, IEEE Press, John Wiley & Sons, 2002.

Reference Books:

1. C. Raja Rao and S.K. Guha, Principles of Medical Electronics and Biomedical Instrumentation, Universities Press, 2001.
2. W.J. Tompkins, Biomedical Digital Signal Processing, Prentice Hall, 1993.
3. Eugene N. Bruce, Biomedical Signal Processing and Signal Modeling, John Wiley & Sons, 2001
4. D.C. Reddy, Biomedical Signal Processing, McGraw Hill, 2005.
5. Duda, R.O., Hart, P.E., and Stork, D.G., Pattern Classification, John Wiley & Sons, 2012.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and the World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-long Learning	PSO1	PSO2
24AECE6ET.1	3	2	-	-	1	-	-	-	-	-	-	3	2
24AECE6ET.2	3	3	-	2	1	-	-	-	-	-	-	2	3
24AECE6ET.3	2	3	2	-	2	-	-	-	-	-	-	3	2
24AECE6ET.4	2	2	3	2	3	-	-	-	-	-	-	2	-
24AECE6ET.5	2	3	2	2	2	-	-	-	-	-	1	2	-



ANNAMACHARYA UNIVERSITY

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RAJAMPET, YSR Kadapa District, AP – 516126, INDIA

Title of the Course : Embedded Systems Lab
Category : PC
Year : III
Semester : II
Couse Code : 24AECE61L
Branch/es : ECE

Lecture Hours

0

Tutorial Hours

0

Practice Hours

3

Credits

1.5

Course Objectives:

1. To learn the interfacing concepts of embedded systems.
2. To develop Embedded Applications

Course Outcomes:

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

1. Write the Assembly Language Programs to perform Arithmetic and logical operations.
2. Interface LED, Seven Segment Display with Microcontrollers.
3. Perform Serial communication with Microcontrollers
4. Interface Keyboard, Buzzer , LCD, Elevator with 8051
5. Interface real time applications

LIST OF EXPERIMENTS: (Execute any 8 experiments)

1. Arithmetic Operations
2. Logical Operations
3. Switch and LED Interfacing
4. LCD Interfacing
5. Serial Transmission
6. Serial Reception
7. Keypad Interfacing
8. Elevator Interfacing
9. Seven segment Display
10. Buzzer Interfacing
11. GSM Interfacing.
12. Sorting RTOS
13. Analog Interfacing

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and the World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-long Learning	PSO1	PSO2
24AECE61L.1	3	3	3	3	-	-	-	-	-	3	-	-	-
24AECE61L.2	3	2	1	1	3	-	-	-	-	3	-	3	3
24AECE61L.3	3	2	1	1	3	-	-	-	-	3	-	3	3
24AECE61L.4	3	3	3	3	3	-	-	-	-	3	-	3	3
24AECE61L.5	3	3	3	3	3	-	-	-	-	3	-	3	3



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RAJAMPET, YSR Kadapa District, AP – 516126, INDIA

Title of the Course : Microwave Engineering Lab
Category : PC
Year : III
Semester : II
Course Code : 24AECE62L
Branch/es : ECE

Lecture Hours

0

Tutorial Hours

0

Practice Hours

3

Credits

1.5

Course Objectives:

1. To familiarize students with microwave test bench setup and experimental procedures for analyzing the characteristics of microwave sources, components, and devices.
2. To enable students to perform standard microwave measurements, such as attenuation, VSWR, impedance, scattering parameters, and waveguide parameters.
3. To develop hands-on skills in testing, analyzing, and interpreting experimental results related to microwave components and antennas.

Course Outcomes:

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

1. Identify and explain the function, applications, and operating principles of microwave components such as klystron, Gunn diode, circulator, magic tee, and directional coupler.
2. Set up and interconnect microwave test bench components correctly and follow proper experimental procedures and safety precautions.
3. Perform microwave measurements including attenuation, VSWR, impedance using Smith chart, and waveguide parameters.
4. Determine and analyze scattering parameters (S-parameters) of microwave junctions such as circulator, magic tee, E-plane tee, and H-plane tee.
5. Analyze radiation characteristics and applications of horn antenna through experimental study.

LIST OF EXPERIMENTS: (Execute any 10 experiments)

1. Study of Reflex Klystron Characteristics.
2. Study of Gunn Diode Characteristics.
3. Study of Attenuation Measurement.
4. Verification of Directional Coupler Characteristics.
5. Determination of VSWR Measurement.
6. Impedance Measurement using smith chart
7. Waveguide parameters measurement
8. Scattering parameters of Circulator
9. Scattering parameters of Magic Tee.
10. Study of Horn Antenna
11. Scattering parameters of E plane Tee
12. Scattering parameters of H Plane Tee

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and the World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-long Learning	PSO1	PSO2
24AECE62L.1	3	1	1	1	2	–	–	–	–	–	1	2	–
24AECE62L.2	2	2	1	2	3	–	–	2	1	–	1	2	–
24AECE62L.3	3	3	1	2	3	–	–	–	–	–	1	2	2
24AECE62L.4	3	3	2	3	2	–	–	–	–	–	1	3	–
24AECE62L.5	3	2	1	2	2	–	–	–	–	–	1	2	–



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RAJAMPET, YSR Kadapa District, AP – 516126, INDIA

Title of the Course : Digital Signal Processing Lab
Category : PC
Year : III
Semester : II
Course Code : 24AECE63L
Branch/es : ECE

Lecture Hours

0

Tutorial Hours

0

Practice Hours

2

Credits

1

Course Objectives:

1. To analyze and verify LTI system properties and signal representations in time and frequency domains using MATLAB
2. To design and implement digital filters, FFT algorithms and multirate signal processing techniques

Course Outcomes:

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

1. Analyze stability, causality, and frequency response of LTI systems.
2. Compute Fourier series, Fourier transform, and power spectral density of signals.
3. Implement linear and circular convolution and N-point FFT.
4. Design analog and digital IIR filters using standard methods.
5. Design and apply FIR filters and multirate signal processing techniques.

LIST OF EXPERIMENTS: (Execute any 10 experiments)

1. To generate the standard discrete time signals such as unit step, unit impulse, ramp, exponential and sawtooth.
2. To Implement and verify autocorrelation for the given sequence and cross correlation between two signals
3. To verify linear convolution.
4. To verify the circular convolution.
5. N-point FFT algorithm
6. MATLAB program to find frequency response of analog LP/HP filters.
7. To Design Butterworth (LP/HP)
8. To Design IIR filter by Impulse Invariant/Bi-Linear Transformation
9. To design FIR filter (LP/HP) using windowing technique a) Using rectangular window b) Using triangular window c) Using Kaiser window
10. To compute power density spectrum of a sequence.
11. Decimation by a factor D
12. Interpolation by a Factor L

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and the World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-long Learning	PSO1	PSO2
24AECE63L.1	2	3	2	2	2	-	-	2	-	-	-	2	3
24AECE63L.2	2	3	2	2	3	-	-	2	-	-	-	2	2
24AECE63L.3	2	3	2	3	3	-	-	2	-	-	-	2	1
24AECE63L.4	2	3	2	3	3	-	-	2	-	-	-	2	2
24AECE63L.5	2	3	3	2	3	-	-	2	-	-	-	2	2