ANNAMACHARYA UNIVERSITY

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

RAJAMPET, YSR District, AP – 516126, INDIA

ELECTRONICS AND COMMUNICATION ENGINEERING

Course Structure and Syllabi for Pre Ph.D.-Programme

SUBJECT-1

S. No	Course Code	Title of the Course
1	26CMEC0TT	Research Methodology for Engineers

SUBJECT-2

S. No	Course Code	Title of the Course
1	26CEEE0NT	Research and Publications ethics for Engineers

CORE SUBJECTS

Choose any Two subjects from the following list

S. No	Course Code	Title of the Course
1	26CECE01T	Image & Video Processing
2	26CECE02T	Digital Signal Processors and Architectures
3	26CECE03T	Embedded Real Time Operating Systems
4	26CECE04T	Advanced Embedded Processor Architecture
5	26CECE05T	Digital System Design
6	26CECE06T	VLSI Technology and Design
7	26CECE07T	Advanced Data Communications
8	26CECE08T	Antenna Measurements
9	26CECE09T	Image Processing and Computer Vision
10	26CECE0AT	Biomedical Imaging Systems
11	26CECE0BT	Real Time Concepts for Embedded Systems
12	26CECE0CT	Microcontrollers for Embedded system Design
13	26CECE0DT	Digital IC Design
14	26CECE0ET	Micro Electronics
15	26CECE0FT	Wireless Communications &Networks
16	26CECE0GT	Microwave Antennas

ANNAMACHARYA UNIVERSITY

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

RAJAMPET, YSR District, AP – 516126, INDIA

Title of the Course	**:**	IMAGE AND VIDEO PROCESSING
Course Code	**:**	26CECE01T
Course offered to	**:**	ECE
Credits	**:**	4

Course Objectives

1. Explain the fundamental steps of digital image processing, including image sampling, quantization, pixel relationships, and image transforms.
2. Apply Fourier, cosine, and wavelet transforms to represent and analyze digital images.
3. Analyze spatial- and frequency-domain image enhancement and segmentation techniques.
4. Describe image compression principles, coding methods, and JPEG standards.
5. Explain video formation, filtering, motion estimation, and coding techniques used in video processing.

Course Outcomes:

1. Describe the basic components and operations of an image processing system.
2. Apply DFT, DCT, and wavelet transforms for image representation and analysis.
3. Analyze image enhancement and segmentation methods in spatial and frequency domains.
4. Compare lossy and lossless compression methods and explain commonly used image coding techniques.
5. Explain video formation models, motion estimation methods, and their applications in video coding.

Unit 1 Fundamentals of Image Processing and Image Transforms 10

Basic steps of Image Processing System Sampling and Quantization of an image – Basic relationship between pixels Image Transforms: 2 D- Discrete Fourier Transform, Discrete Cosine Transform (DCT), Wavelet Transforms: Continuous Wavelet Transform, Discrete Wavelet Transforms.

Unit 2 Image Processing Techniques 10

Image Enhancement: Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, smoothing spatial filters, Sharpening spatial filters. Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering.

Image Segmentation: Segmentation concepts, Point, Line and Edge Detection, Thresholding, Region Based segmentation.

Unit 3 Image Compression 10

Image compression fundamentals - Coding Redundancy, Spatial and Temporal redundancy, Compression models: Lossy& Lossless, Huffman coding, Arithmetic coding, LZW coding, Run length coding, Bit plane coding, Transform coding, Predictive coding, Wavelet coding, JPEG Standards.

Unit 4 Basic Steps of Video Processing 9

Analog Video, Digital Video. Time- Varying Image Formation models: Three-Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation, Sampling of Video signals, Filtering operations.

Unit 5 2-D Motion Estimation 10

Optical flow, General Methodologies, Pixel Based Motion Estimation, Block- Matching Algorithm, and 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.

Prescribed Textbooks:

1. Digital Image Processing – Gonzalez and Woods, 3rd ed., Pearson.
2. Video processing and communication – Yao Wang, Joem Ostermann and Ya–quin Zhang. 1st Ed., PH Int.

Reference Books:

1. Digital Video Processing – M. Tekalp, Prentice Hall International

ANNAMACHARYA UNIVERSITY

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

RAJAMPET, YSR District, AP – 516126, INDIA

Title of the Course	**:**	DSP PROCESSORS AND ARCHITECTURES
Course Code	**:**	26CECE02T
Course offered to	**:**	ECE
Credits	**:**	4

Course Objectives

1. Introduce the principles and building blocks of digital signal processing systems.
2. Explain sampling, discrete-time sequences, DFT, FFT, digital filtering, decimation, and interpolation.
3. Analyze numerical formats, dynamic range, precision, and sources of computational errors in DSP.
4. Describe programmable DSP architectures, addressing modes, memory organization, and execution features.
5. Explain DSP programming and the interfacing of memory and I/O peripherals, including DMA.

Course Outcomes:

1. Explain the Fundamental concepts and operations of digital signal processing systems.
2. Analyze computational accuracy and identify error sources in DSP implementations.
3. Describe architectural features and computational building blocks of programmable DSP devices.
4. Explain the programming model, addressing modes, peripherals, interrupts, and pipeline operation of TMS320C54XX processors.
5. Describe memory and I/O interfacing techniques, including programmed I/O, interrupt-driven I/O, and DMA.

Unit 1 Introduction to Digital Signal Processing 10

Introduction, A Digital signal processing system, the sampling process, discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), linear time – invariant systems, Digital filters, Decimation and interpolation.

Unit 2 Computational Accuracy in DSP Implementations 9

Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational error, D/A Conversion Errors, Compensating filter.

Unit 3 Architectures for Programmable DSP Devices 9

Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing.

Unit 4 Programmable Digital Signal Processors 10

Commercial Digital signal processing Devices, Data Addressing modes of TMS320C54XXDSPs, Data Addressing modes of TMS320C54XX Processors, memory space of TMS320C54XX Processors, Program Control TMS320C54XX instructions and Programming, On – Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

Unit 5 Interfacing Memory and I/O Peripherals to Programmable DSP Devices **10**

Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/ O, Direct memory access (DMA).

Prescribed Textbook:

1. Digital signal processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. A Practical Approach to Digital Signal Processing - K Padmanabhan, R. Vijayarajeswaran, Ananthi. S, New Age International, 2006/2009.

Reference Books:

1. Digital Signal Processors, Architecture, Programming and Applications – B. Venkataramani and M. Bhaskar, 2002, TMH
2. Digital Signal Processing – Jonatham Stein, 2005, John Wiley.
3. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. 2000, S. Chand & Co.
4. Embedded Signal Processing with the Micro Signal Architecture Publisher: Woon-Seng Gan, Sen M. Kuo, Wiley-IEEE Press, 2007.

ANNAMACHARYA UNIVERSITY

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

RAJAMPET, YSR District, AP – 516126, INDIA

Title of the Course	**:**	EMBEDDED REAL TIME OPERATING SYSTEMS
Course Code	**:**	26CECE03T
Course offered to	**:**	ECE
Credits	**:**	4

Course Objectives

1. Introduce UNIX/Linux commands, file I/O operations, and process-control mechanisms relevant to embedded systems.
2. Explain RTOS characteristics, task states, scheduling, synchronization, and concurrency.
3. Describe RTOS objects and services, including pipes, event registers, signals, and I/O subsystems.
4. Explain exception handling, interrupt processing, real-time clocks, and timer services.
5. Review representative real-time operating systems and their use in embedded applications.

Course Outcomes:

1. Use basic UNIX/Linux commands and explain file and process-control operations.
2. Explain RTOS scheduling, task management, synchronization, semaphores, and message queues.
3. Describe RTOS objects, communication mechanisms, and input/output services.
4. Explain the handling of exceptions and interrupts and the operation of real-time timers.
5. Compare RTOS platforms such as RT Linux, MicroC/OS-II, VxWorks, TinyOS, and embedded Linux.

Unit 1 Introduction 10

INTRODUCTION: Introduction to UNIX/LINUX, Overview of Commands, File I/O, (open, create, close, lseek, read, write), Process Control (fork, vfork, exit, wait, waitpid, exec.)

Unit 2 Real Time Operating Systems 11

REAL TIME OPERATING SYSTEMS: Brief History of OS, Defining RTOS, The Scheduler, Objects, Services, Characteristics of RTOS, defining a Task, asks States and Scheduling, Task Operations, Structure, Synchronization, Communication and Concurrency. Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage, Operations and Use

Unit 3 Objects, Services and I/O 9

OBJECTS, SERVICES, AND I/O: Pipes, Event Registers, Signals, Other Building Blocks, Component Configuration, Basic I/O Concepts, I/O Subsystem

Unit 4 Exceptions, Interrupts and Timers 9

Exceptions, Interrupts, Applications, Processing of Exceptions and Spurious Interrupts, Real Time Clocks, Programmable Timers, Timer Interrupt Service Routines (ISR), Soft Timers, Operations

Unit 5 Case Studies of RTOS **9**

RT Linux, Micro C/OS-II, Vx Works, Embedded Linux, Tiny OS and Basic Concepts of Android OS.

Prescribed Textbooks:

1. Real-Time Systems-Jane W. S. Liu, Pearson Education.
2. Embedded Systems: Real-Time Operating Systems for ARM Cortex-M Microcontrollers- Jonathan W. Valvano, CreateSpace Independent Publishing.

Reference Books:

1. Real-Time Concepts for Embedded Systems - Qing Li and Caroline Yao, CMP Books.
2. MicroC/OS-II: The Real-Time Kernel - Jean J. Labrosse, CRC Press.
3. Embedded Real-Time Systems Programming-Sriram V. Iyer and Pankaj Gupta, Tata McGraw Hill.
4. Operating Systems: Internals and Design Principles -William Stallings, Pearson.
5. Linux Device Drivers- Jonathan Corbet, Alessandro Rubini, and Greg Kroah-Hartman, O'Reilly Media.

ANNAMACHARYA UNIVERSITY

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

RAJAMPET, YSR District, AP – 516126, INDIA

Title of the Course	**:**	ADVANCED EMBEDDED PROCESSOR ARCHITECTURE
Course Code	**:**	26CECE04T
Course offered to	**:**	ECE
Credits	**:**	4

Course Objectives

1. Explain ARM Cortex-M4 architecture, register sets, address space, instruction basics, and GPIO control.
2. Describe interrupt handling, timers, RTC, ADC, PWM, and quadrature encoder interfaces.
3. Explain I2C, SPI, USB, and UART communication protocols and their implementation.
4. Analyze ARMv8-A architecture, memory management, caches, branch prediction, synchronization, and security.
5. Introduce DSP processor architecture, programming, peripherals, and real-time signal-processing applications.

Course Outcomes:

1. Describe ARM Cortex-M4 architecture, addressing modes, system registers, and memory-mapped peripherals.
2. Explain the configuration and programming of interrupts, timers, ADC, PWM, RTC, and QEI modules.
3. Implement or outline interfacing through I2C, SPI, USB, and UART protocols.
4. Explain ARMv8-A memory management, cache coherency, power management, virtualization, and debugging.
5. Describe DSP processor instructions, pipeline operation, development tools, and real-time applications.

Unit 1 Foundations of Engineering Research 11

Introduction to the ARM Cortex M4 and its targeted applications, ARM Cortex M4 architecture address space, on- chip peripherals (analog and digital) Register sets, addressing modes and instruction set basics. ARM Cortex M4: I/O pin multiplexing, pull up/down registers, GPIO control, Memory Mapped Peripherals, programming System registers.

Unit 2 Literature Review and Research Planning 10

Introduction to Interrupts, Interrupt vector table, interrupt programming. Timer, Basic Timer, Real Time Clock (RTC), Timing generation and measurements, ADC. PWM Module & Quadrature Encoder Interface (QEI).

Unit 3 Research Design and Data Collection 9

I2C protocol, SPI protocol, USB & UART protocol. Implementing and programming I2C, SPI, USB & UART interface.

Unit 4 Statistical Analysis and Optimization 10

Introduction to ARMv8-A, ARMv8-A Memory Management, ARMv8-A Memory Model, Caches and Branch Prediction, Synchronization and Cache coherency. Booting, Power Management, Virtualization, Security, Debugging.

Unit 5 Research Communication and Professional Development 10

Standard research terminology, Paper writing: title, abstract, structure, Peer review process, Conference and poster presentations, Patent drafting basics and intellectual property, Publication trends and research career development.

Prescribed Textbook:

1. Joseph Yiu, The Definitive Guide to ARM Cortex-M3 and Cortex-M4 Processors=, 2013, 3rd Edition, Newnes ,UK.
2. ARM Cortex-A Series Programmers Guide for ARMv8-A Version: 1.0, 2015, ARM, United States.

Reference Books:

1. Harris and Harris, Digital Design and Computer Architecture: ARM Edition, 2015, Morgan Kaufmann, , United States.
2. Yifeng Zhu, Embedded Systems with ARM Cortex-M Microcontrollers in Assembly Language and C, 2015, 2nd Edition, E-Man Press LLC, United States.
3. Avtar Singh and S. Srinivasan, Digital Signal Processing – Implementations using DSP Microprocessors with Examples from TMS320C54xx, CLI Private Limited, Delhi 2012.
4. B. Venkataramani and M. Bhaskar, Digital Signal Processors – Architecture, Programming and Applications – Tata McGraw – Hill Publishing Company Limited. New Delhi, 2003.
5. James A Langbridge, <Professional Embedded ARM Development=, 2014,1st Edition, John Wiley Sons & Inc., United States.
6. Jonathan W. Valvono <Introduction to ARM Cortex-M Microcontrollers=, 2014, 5th Edition, Create Space Independent Publishing Platform, United States.
7. Relph Chassaing and Donald Reay, Digital Signal Processing and Applications with the C6713 and C6416 DSK, John Wiley and

ANNAMACHARYA UNIVERSITY

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

RAJAMPET, YSR District, AP – 516126, INDIA

Title of the Course : DIGITAL SYSTEM DESIGN
Course Code : 26CECE05T
Course offered to : ECE
Credits : 4

Course Objectives	
1.	Explain the principles and canonical representations of combinational logic functions.
2.	Apply Karnaugh maps and Quine–McCluskey techniques to simplify Boolean functions.
3.	Analyze and design combinational circuits using decoders, encoders, multiplexers, adders, and comparators.
4.	Explain flip-flops, registers, counters, and synchronous sequential-circuit models.
5.	Design digital systems using state machines, sequence detectors, code converters, and programmable logic devices.

Course Outcomes	
1.	Represent Boolean functions using truth tables, canonical forms, and switching equations.
2.	Simplify Boolean expressions using Karnaugh maps and Quine–McCluskey methods.
3.	Design combinational logic circuits using standard functional blocks and programmable logic devices.
.4	Analyze flip-flops, registers, ripple counters, synchronous counters, and state-machine models.
5.	Develop designs for sequence detectors, code converters, arithmetic circuits, and sequential systems using ROMs, PLAs, CPLDs, or FPGAs.

Unit 1 Principles of Combinational Logic 10

Definition of combinational logic, canonical forms, Generation of switching equations from truth tables, Karnaugh maps-3,4 variables, incompletely specified functions (Don't care terms) Simplifying Max term equations, Quine-McClusky techniques – 3 & 4 variables.

Unit 2 Analysis and Design of Combinational Logic 9

Decoders, Encoders, Digital multiplexers, Adders and subtractors, Look ahead carry, Binary comparators. Programmable Logic Devices, Complex PLD, FPGA.

Unit 3 Flip-Flops and its Applications 10

Basic Bistable elements, Latches, The master-slave flipflops (pulse-triggered flip-flops): SR flip-flops, JK flip-flops, Characteristic equations, Registers, binary ripple counters, and synchronous binary counters.

Unit 4 Sequential Circuit Design 10

Design of a synchronous counter, Design of a synchronous mod-n counter using clocked JK, D, T and SR flip-flops. Mealy and Moore models, State machine notation, Construction of state diagrams.

Unit 5 Applications o f Digital Circuits 10

Design of a Sequence Detector, Guidelines for construction of state graphs, Design Example – Code Converter, Design of Iterative Circuits (Comparator), Design of Sequential Circuits using ROMs and PLAs, CPLDs and FPGAs, Serial Adder with Accumulator, Design of Binary Multiplier, Design of Binary Divider.

Prescribed Textbooks:

1. John M Yarbrough,-Digital Logic Applications and Design, Thomson Learning,2001.
2. Donald D. Givone, —Digital Principles and Design, McGraw Hill, 2002.

Reference Books:

1. D. P. Kothari and J. S Dhillon, Digital Circuits and Design, Pearson, 2016
2. Morris Mano, Digital Design, Prentice Hall of India, Third Edition.
3. K. A. Navas, Electronics Lab Manual, Volume I, PHI, 5th Edition, 2015.
4. Charles H Roth Jr., Larry L. Kinney —Fundamentals of Logic Design, Cengage Learning, 7th Edition.

ANNAMACHARYA UNIVERSITY

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

RAJAMPET, YSR District, AP – 516126, INDIA

Title of the Course	**:**	VLSI TECHNOLOGY AND DESIGN
Course Code	**:**	26CECE06T
Course offered to	**:**	ECE
Credits	**:**	4

Course Objectives

1. Explain VLSI applications, CMOS technology, integrated-circuit manufacturing, reliability, and design economics.
2. Describe hierarchical design, abstraction, CAD-based design flow, and intellectual-property reuse.
3. Develop an understanding of VHDL data types, operators, and behavioral and dataflow modeling.
4. Explain structural HDL modeling, test benches, simulation, synthesis, CPLDs, and FPGAs.
5. Analyze CMOS logic circuits with respect to propagation delay, power consumption, and dissipation.

Course Outcomes

1. Explain VLSI technology, manufacturing considerations, power, testability, reliability, and design flow.
2. Describe IP-based design and hierarchical abstraction in integrated-circuit development.
3. Write or interpret VHDL descriptions for combinational and sequential circuits using appropriate modeling styles.
4. Explain HDL test benches, simulation and synthesis issues, and the architectures of CPLDs and FPGAs.
5. Analyze CMOS logic circuits and discuss their delay and power characteristics.

Unit 1 Introduction to VLSI 10

Applications of VLSI, Advantages, Integrated Circuit Manufacturing - Technology and Economics; CMOS Technology - Power consumption, Design and Testability, Reliability; Integrated Circuit Design Techniques - Hierarchical Design, Design Abstraction and CAD; IP based design - types of IP, IP across design Hierarchy, IP Life cycle.

Unit 2 Basic HDL Constructs 9

VLSI Design flow, Overview of different modeling styles in VHDL, Data types, operators and data objects in VHDL, Dataflow Modeling, Behavioral Modeling, using VHDL for combinational Circuits and sequential Circuits.

Unit 3 Hardware Description Language 10

Structural Modeling, Subprograms, Packages and Libraries, Generics, Configurations, attributes. Simple Test Bench, Simulation and Synthesis issues, case study of ALU/ Sequence Detector, Comparison of various Hardware Description Languages.

Unit 4 Programmable Logic Devices 10

Introduction to CPLDs: Function block architecture, input/output block, switch matrix, Study of architecture of CPLDs of Altera/Xilinx.

Introduction to FPGAs: Configurable logic block, input/output block and interconnect, Study of architecture of FPGAs of Xilinx /Altera.

Unit 5 CMOS Circuits 9

Different logic families, MOS Transistor, CMOS as an inverter, propagation delay, power consumption/ dissipation issues, simple circuits using CMOS.

Prescribed Textbooks:

1. Weste, Neil H.E., and David Harris, CMOS VLSI Design: A Circuits and Systems Perspective, 4th Edition, Pearson Education, 2011.
2. John P. Uyemura, Introduction to VLSI Circuits and Systems, Wiley, 2002.

Reference Books:

1. Samir Palnitkar, Verilog HDL: A Guide to Digital Design and Synthesis, 2nd Edition, Pearson Education, 2003.
2. Douglas J. Smith, HDL Chip Design: A Practical Guide for Designing, Synthesizing, and Simulating FPGA and ASIC Projects, 3rd Edition, Doone Publications, 2008.
3. R. Jacob Baker, CMOS: Circuit Design, Layout, and Simulation, 3rd Edition, Wiley-IEEE Press, 2010.
4. Michael D. Ciletti, Advanced Digital Design with the Verilog HDL, 2nd Edition, Pearson Education, 2011.

ANNAMACHARYA UNIVERSITY

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

RAJAMPET, YSR District, AP – 516126, INDIA

Title of the Course	**:**	ADVANCED DATA COMMUNICATIONS
Course Code	**:**	26CECE07T
Course offered to	**:**	ECE
Credits	**:**	4

Course Objectives

1. Explain network elements, protocol architectures, the OSI model, access technologies, and LAN operation.
2. Describe Frame Relay, PPP, SONET packet transport, MPLS forwarding, and fast reroute.
3. Analyze network-, transport-, and application-layer protocols and Internet routing methods.
4. Explain router and switch architectures and evaluate queuing delay and cell-loss performance.
5. Describe QoS mechanisms, traffic management, congestion control, and Voice over IP.

Course Outcomes:

1. Explain network architectures, OSI layers, access technologies, ATM services, and Ethernet variants.
2. Describe frame formats and operations of Frame Relay, PPP, and MPLS-based networks.
3. Differentiate IPv4/IPv6, transport and application protocols, and unicast/multicast routing protocols.
4. Analyze router/switch architectures and performance measures such as queuing delay and cell-loss ratio.
5. Explain QoS protocols, scheduling disciplines, admission control, traffic engineering, and VoIP architecture.

Unit 1 Introduction 11

Introduction of data networks: network elements, protocols, and applications, Protocols: OSI reference model, Physical Layer and Access Network Technologies: SONET, DSL, cable, PON ATM Protocols and Services, Physical, ATM, and AAL layers: functions and PDU formats ATM services. Local Area Networks: Ethernet, Fast Ethernet, Switched Ethernet, Gigabit Ethernet, Access control protocol, Performance analysis

Unit 2 Frame Relay 10

Frame format and functions, congestion control. Point-to-Point Protocol: PPP format and operations, Packet over SONET, Multi-Protocol Label switching: MPLS protocol, forwarding and control components, MPLS fast- reroute, Pseudo-wire emulation

Unit 3 Network Layer 10

Internet Protocol Suite, Protocol model, Network layer protocols: IPv4, IPv6, ICMP, Transport layer protocols: TCP, UDP, RTP, Application protocols: Telnet, DNS, FTP, RTSP, HTTP, SNMP Internet Routing: Unicast routing protocols: RIP, OSPF, IS-IS, BGP, Multicast routing protocols: DVMRP, MOSPF,CBT, PIM

Unit 4 Transport and Higher Layers 9

Router/Switch Design: Architectures: single stage, multi-interconnect network, Performance analysis: queuing delay and cell loss ratio

Unit 5 QOS and Traffic Management 10

QOS: QOS Protocols: IntServ/RSVP, DiffServ, MPLS, SBM, Queuing and scheduling disciplines, Congestion control techniques. Traffic Management: Network dimensioning, Call admission control, Usage parameter control/ Network parameter control, MPLS- Traffic engineering. Voice over IP: Codecs, Network architecture & protocols.

Prescribed Textbook:

1. Computer Networks: A. S. Tanenbaum, 4th Edution, PHI .

Reference Books:

1. An engineering Approach to Computer Networking, S. Keshav, Person Edition.
2. Computer Networking a top – Down Approach Featuring the Internet, J. F. Kurose, K. W. Ross, Pearson Education

ANNAMACHARYA UNIVERSITY

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

RAJAMPET, YSR District, AP – 516126, INDIA

Title of the Course	**:**	ANTENNA MEASUREMENTS
Course Code	**:**	26CECE08T
Course offered to	**:**	ECE
Credits	**:**	4

Course Objectives

1. Explain antenna measurement principles, near- and far-field regions, reciprocity, and measurement environments.
2. Describe methods for measuring radiation patterns, gain, directivity, and polarization.
3. Explain antenna impedance, reflection coefficient, VSWR, and bandwidth measurement techniques.
4. Describe near-field and far-field measurement systems and relevant simulation tools.
5. Analyze measurement errors, calibration procedures, uncertainty, and methods to improve precision.

Course Outcomes:

1. Explain antenna measurement fundamentals and select suitable measurement environments.
2. Describe techniques for measuring radiation patterns, gain, directivity, and polarization.
3. Interpret impedance, reflection coefficient, VSWR, and antenna bandwidth measurements.
4. Compare planar, cylindrical, spherical near-field, far-field, and compact-range techniques.
5. Identify measurement error sources and explain calibration and uncertainty-analysis procedures.

Unit 1 Introduction to Antenna Measurements 10

Fundamentals of Antenna Measurements, Basics of Antenna Measurement Principles, Near-field and Far-field regions, Reciprocity principle in antenna measurements, Measurement Environment, Anechoic chambers and open-area test sites, Indoor vs. outdoor measurement setups

Unit 2 Measurement Techniques for Antenna Parameters 10

Radiation Pattern Measurements, Azimuth and elevation pattern measurement methods, 3D and polar pattern plotting, Gain and Directivity Measurement, Comparison method and gain-transfer method, Absolute gain measurement, Polarization Measurement, Co-polar and cross-polar discrimination

Unit 3 Antenna Impedance and Bandwidth Measurement 9

Impedance Measurement Techniques, Reflection coefficient and VSWR, Bandwidth Determination, Impedance bandwidth and its significance

Unit 4 Advanced Measurement Systems 10

Near-Field Measurement Techniques, Planar, cylindrical, and spherical near-field measurements, Far-Field Measurement Techniques, Compact ranges and reflector antenna measurements, Modern Tools and Simulation Software, HFSS, CST Studio Suite, and MATLAB for antenna analysis

Unit 5 Error Analysis and Calibration in Measurements 10

Sources of Errors in Antenna Measurements, Instrumentation, alignment, and environmental factors, Calibration Techniques, Methods for minimizing systematic errors, Measurement Uncertainty Analysis, Quantifying and improving measurement precision

Prescribed Textbooks:

1. C.A. Balanis, Antenna Theory: Analysis and Design, Wiley, Latest Edition.
2. Robert A. Sainati, CAD of Microstrip Antennas for Wireless Applications, Artech House.

Reference Books:

1. Principles of Planar Near-Field Antenna Measurements, Stuart Gregson, John McCormick, C. Parini, The Institution of Engineering and Technology (IET).
2. Antenna Measurement Techniques, H.W. Ehrenspeck and J.A. Murphy, Artech House.
3. Antenna Handbook, Y.T. Lo and S.W. Lee, Springer.
4. Microwave Engineering, David M. Pozar, Wiley.

ANNAMACHARYA UNIVERSITY

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

RAJAMPET, YSR District, AP – 516126, INDIA

Title of the Course	**:**	IMAGE PROCESSING AND COMPUTER VISION
Course Code	**:**	26CECE09T
Course offered to	**:**	ECE
Credits	**:**	4

Course Objectives

1. Explain digital image fundamentals, the electromagnetic spectrum, image formation, and digitization.
2. Apply histogram processing and spatial- and frequency-domain image enhancement methods.
3. Describe image restoration strategies and noise models in spatial and frequency domains.
4. Explain color image processing, image segmentation, edge detection, and edge linking.
5. Introduce computer-vision descriptors, object detection, tracking, and application areas.

Course Outcomes:

1. Describe image formation, digitization, pixel connectivity, and distance measures.
2. Analyze and apply image enhancement techniques in spatial and frequency domains.
3. Explain image degradation, noise models, and image restoration methods.
4. Describe color processing, segmentation, edge detection, and edge-linking techniques.
5. Explain HOG, SIFT, and SURF descriptors and discuss object detection and tracking applications.

Unit 1 Fundamentals of Digital Imaging **9**

Digital Image Fundamentals, Light and Electromagnetic Spectrum, Components of Image Processing System, Image Formation and Digitization, Pixel Connectivity, Distance Measures

Unit 2 Advanced Image Enhancement Techniques **9**

Image Enhancements, Histogram Processing, Spatial and Frequency Domain Methods

Unit 3 Image Restoration 9

Strategies Image Restoration, Noise Models, Restoration Techniques in Spatial and Frequency Domains

Unit 4 Color Processing and Segmentation **9**

Color Image Processing, Image Segmentation, Edge Detection and Linking

Unit 5 Computer Vision and Applications **9**

Computer Vision, Feature Descriptors (HOG, SIFT, SURF), Object Detection and Tracking, Applications in Various Fields

Prescribed Textbooks:

1. Digital Image Processing - Rafael C. Gonzalez and Richard E. Woods, 4th Edition, Pearson.

2. Fundamentals of Digital Image Processing- Anil K. Jain, PHI Learning.earch Methods for Engineers" by David Thiel. Cambridge University Press. ISBN: 9781139542326

Reference Books:

1. Digital Image Processing and Analysis: Human and Computer Vision Applications with CVIPtools- Scott E. Umbaugh, 3rd Edition, CRC Press.
2. Image Processing, Analysis, and Machine Vision- Milan Sonka, Vaclav Hlavac, and Roger Boyle, Cengage Learning
3. Computer Vision: Algorithms and Applications- Richard Szeliski, Springer
4. Pattern Recognition and Image Analysis- Earl Gose, Richard Johnsonbaugh, and Steve Jost, PHI Learning.

ANNAMACHARYA UNIVERSITY

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

RAJAMPET, YSR District, AP – 516126, INDIA

Title of the Course	**:**	BIO-MEDICAL IMAGING SYSTEMS
Course Code	**:**	26CECE0AT
Course offered to	**:**	ECE
Credits	**:**	4

Course Objectives

1.. Explain time-domain, statistical, and information-theoretic analysis of biomedical signals.
2. Apply Fourier, short-time Fourier, DCT, wavelet, and Hilbert transforms to bio signal analysis.
3. Describe time- and frequency-domain filters for reducing artifacts and noise in biomedical signals.
4. Explain feature extraction and linear-discrimination approaches for EMG, ECG, EEG, and ultrasound signals.
5. Describe virtual instrumentation, graphical interfaces, and multichannel data acquisition using LabVIEW.

Course Outcomes:

1 Analyze biomedical signals using time-domain, statistical, and information-theoretic methods.
2 Explain and apply spectral and time-frequency transforms for biosignal analysis.
3 Compare filtering techniques for reducing biomedical artifacts and noise.
4 Describe methods for EMG motor-activity detection, ECG heart-rate estimation, EEG spectral estimation, and ultrasound filtering.
5 Explain virtual instrumentation and the development of graphical interfaces for multichannel data acquisition.

Unit 1 Introduction to Signals 10

Time domain - Statistical and information theoretic analysis. Fourier spectrum of bio signals, short-time Fourier transform and spectrogram- DCT and its applications - Wavelet transform and time frequency analysis - Hilbert transform and its applications

Unit 2 Types of Artefacts and Noise 9

Time domain filters, frequency domain filters, notch and comb filters, optimal filtering, adaptive filters - Signal decomposition-based filtering.

Unit 3 Signal Segmentation 9

Envelop extraction and analysis, temporal, spectral, statistical, information theoretic and cross spectral features - Waveform complexity.

Unit 4 Linear Discrimination 9

Detection of motor activity from EMG, Harmonic analysis - Estimation of heart rate in ECG - Auto-regressive model - Estimation of spectrum of thoughts in EEG - Matched and Wiener filter for filtering in ultrasound.

Unit 5 Virtual Instrumentation and Data Acquisition 9

Virtual instrument and traditional instrument, hardware and software-Building Graphical User interfaces for use in data acquisition - Graphical programming- multi-channel data acquisition in LabVIEW.

Prescribed Textbooks:

1. Leslie Cromwell, Biomedical Instrumentation and Measurement, 2015, 2nd Edition, Pearson Education India, Bengaluru.
2. John G. Webster, Medical Instrumentation Application and Design, 2015, 4th Edition, John Wiley and sons, New Jersey.

Reference Books:

1. Robert H King, Introduction to Data Acquisition with LabVIEW, 2012, 2nd Edition, McGraw Hill, New York.
2. Joseph Bronzino Donal.R Petrson,Handbook of Biomedical Engineering 2015, 4thEdition, CRC Press, Florida.

Title of the Course : REAL TIME CONCEPTS FOR EMBEDDED SYSTEMS
Course Code : 26CECE0BT
Course offered to : ECE
Credits : 4

Course Objectives

1. Explain embedded-system design processes, methodologies, requirements, architecture, and quality assurance.
2. Describe ARM processor architecture, instruction sets, peripherals, timers, PWM, and UART.
3. Analyze embedded software compilation, linking, loading, performance, energy, and code-size optimization.
4. Explain real-time system timing, task scheduling, fault tolerance, reliability, and clock synchronization.
5. Describe embedded operating systems, inter-process communication, distributed systems, and multiprocessor platforms.

Course Outcomes:

1. Explain the stages and design methodologies used in embedded-system development.
2. Describe ARM processor features and the operation of common embedded peripherals.
3. Analyze embedded programs for performance, power, code size, validation, and testing.
4. Explain real-time scheduling, runtime estimation, fault tolerance, reliability, and clock synchronization.
5. Describe process management, real-time operating systems, inter-process communication, and distributed embedded architectures.

Unit 1 Introduction To Embedded System Design 10

Microprocessors– Embedded system design process –Design example: Model train controller- Design methodologies- Design flows – Requirement Analysis – Specifications-System analysis and architecture design – Quality Assurance techniques -Designing with computing platforms – consumer electronics architecture –platform-level performance analysis.

Unit 2 ARM Processor and Peripherals 10

ARM Architecture Versions – ARM Architecture – Instruction Set – Stacks and Subroutines – Features of the LPC 214X Family – Peripherals – The Timer Unit – Pulse Width Modulation Unit – UART – Block Diagram of ARM9 and ARM Cortex M3 MCU.

Unit 3 Embedded Programming 10

Components for embedded programs- Models of programs- Assembly, linking and loading – compilation techniques- Program level performance analysis – Software performance optimization – Program level energy and power analysis and optimization – Analysis and optimization of program size- Program validation and testing.

Unit 4 Real Time Systems 9

Structure of a Real Time System –– Estimating program run times – Task Assignment and Scheduling – Fault Tolerance Techniques – Reliability, Evaluation – Clock Synchronization.

Unit 5 Processes and Operating Systems 11

Introduction – Multiple tasks and multiple processes – Multirate systems- Preemptive realtime operating systems- Priority based scheduling- Inter process communication mechanisms – Evaluating operating system performance- power optimization strategies for processes –Example Real time operating systems-POSIX-Windows CE. – Distributed embedded systems – MPSoCs and shared memory multiprocessors. – Design Example – Audio player, Engine control unit – Video accelerator.

Prescribed Textbooks:

1. Embedded System Design: A Unified Hardware/Software Introduction-Frank Vahid and Tony Givargis, Wiley.
2. ARM System Developer's Guide: Designing and Optimizing System Software- Andrew N. Sloss, Dominic Symes, and Chris Wright, Elsevier.

Reference Books:

1. Embedded Systems: Architecture, Programming and Design-Raj Kamal, Tata McGraw Hill.
2. The Art of Designing Embedded Systems- Jack Ganssle, Elsevier.
3. Real-Time Systems: Theory and Practice- Rajib Mall, Pearson.
4. Computers as Components: Principles of Embedded Computing System Design-Marilyn Wolf, Elsevier.
5. Embedded Real-Time Systems Programming-Sriram Iyer and Pankaj Gupta, tata McGraw Hill.

ANNAMACHARYA UNIVERSITY

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

RAJAMPET, YSR District, AP – 516126, INDIA

Title of the Course	**:**	MICROCONTROLLERS FOR EMBEDDED SYSTEM DESIGN
Course Code	**:**	26CECE0CT
Course offered to	**:**	ECE
Credits	**:**	4

Course Objectives

1. Explain the differences between microprocessors and microcontrollers and the architecture of the 8051.
2. Develop an understanding of 8051 programming in C and assembly and its interface mechanisms.
3. Describe ARM architecture, processor states, registers, modes, exceptions, and pipelining.
4. Explain ARM instruction categories and their use in embedded program development.
5. Describe LPC214X ARM-core microcontroller architecture, memory, I/O ports, timers, and peripherals.

Course Outcomes:

1. Differentiate microprocessors and microcontrollers and describe the 8051 architecture.
2. Explain 8051 programming and interfacing concepts using C and assembly language.
3. Describe ARM architecture, operating states, registers, exception handling, and pipeline operation.
4. Classify and explain ARM data-processing, branch, load/store, and other instruction types.
5. Explain LPC214X architecture, memory addressing, I/O ports, timers, and embedded peripheral functions.

Unit 1 8051 Microcontroller 10

Microprocessors Vs Microcontrollers; Classification–bits, memory architecture, ISA; Little Endian Vs Big Endian. 8051 Architecture – Timers, Interrupts, Register Architecture (banks), PSW register, Memory architecture; Instruction set.

Unit 2 8051 Programming and Interfaces 9

Programming in C & Assembly for– Interrupts, Timers and Interfaces – PORTS, LED, ADC, SENSORS, LCD, DAC, and serial Communication.

Unit 3 ARM 9

ARM Design Philosophy; Overview of ARM architecture; States [ARM, Thumb, Jazelle]; Registers, Modes; Conditional Execution; Pipelining; Vector Tables; Exception handling.

Unit 4 Instruction Set 9

ARM Instruction- data processing instructions, branch instructions, load store instructions, SWI instruction, Loading instructions, conditional Execution, Assembly Programming.

Thumb Instruction-Thumb Registers, ARM Thumb interworking, branch instruction, data processing instruction, single/multiple load store instruction, Stack instruction, SWI instruction, Assembly Programming.

Unit 5 ARM Core Based Microcontroller 9

Architecture of LPC214X, Memory Addressing, IO ports, Timers/counter, Watch Dog timer, PWM, ADC/DAC, UART, Interrupts, Displays, C programming.

Prescribed Textbooks:

1. Andrew N.Sloss, Dominic Symes, Chris Wright, ARM Developer's Guide, 2010, 1st Edition, Elsevier, United States.
2. Kenneth Ayala, The 8051 Microcontroller & Embedded Systems Using Assembly and C, 2010, 1st edition, Cengage Learning, United States.

Reference Books:

1. Steve Furber ARM System on Chip Architecture, 2010, 2nd Edition, Addison Wesley, United States
2. Joseph Bronzino Donal.R Petrson, Handbook of Biomedical Engineering 2015, 4thEdition, CRC Press, Florida.
3. Technical Reference Manual CORTEX M-3, ARM, 2010.

ANNAMACHARYA UNIVERSITY

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

RAJAMPET, YSR District, AP – 516126, INDIA

Title of the Course : DIGITAL IC DESIGN
Course Code : 26CECE0DT
Course offered to : ECE
Credits : 4

Course Objectives

1. Explain MOS inverter characteristics, threshold voltage, gain, transient response, and delay.
2. Analyze NMOS-load and CMOS combinational logic circuits and derive logic implementations.
3. Describe bistable elements, latches, and CMOS flip-flop circuits.
4. Explain dynamic logic principles, bootstrapping, pass-transistor circuits, and high-performance dynamic logic.
5. Describe semiconductor memory types, RAM organization, and DRAM operation and leakage.

Course Outcomes:

1. Analyze pseudo-NMOS inverter operation and its voltage-transfer and transient characteristics.
2. Design and analyze combinational MOS logic circuits, including basic and complex CMOS gates.
3. Explain the operation of SR latches, clocked latches, and CMOS flip-flops.
4. Describe dynamic CMOS logic techniques and evaluate their design principles.
5. Explain semiconductor memory types, RAM array organization, and DRAM operation.

Unit 1 MOS Design Pseudo NMOS Logic 10

Inverter, Inverter threshold voltage, Output high voltage, Output Low voltage, Gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

Unit 2 Combinational MOS Logic Circuits 10

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

Unit 3 Sequential MOS Logic Circuits 9

Behavior of bi-stable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch and edge triggered flip-flop.

Unit 4 Dynamic Logic Circuits 9

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

Unit 5 Semiconductor Memories 10

Virtual instrument and traditional instrument, hardware and software-Building Graphical User interfaces for use in data acquisition - Graphical programming- multi-channel data acquisition in LabVIEW.

Prescribed Textbooks:

1. John P. Uyemura, Introduction to VLSI Circuits and Systems, Wiley, 2002.
2. Kamran Eshraghian, David A. Pucknell, Essentials of VLSI Circuits and Systems, Prentice- Hall, 2005.

Reference Books:

1. Morris Mano, Digital Design, 5th Edition, Pearson, 2013.
2. Weste, Neil H.E., and David Harris, CMOS VLSI Design: A Circuits and Systems Perspective, 4th Edition, Pearson Education, 2011.
3. Douglas A. Pucknell, Kamran Eshraghian, Basic VLSI Design: Systems and Circuits, 3rd Edition, Prentice-Hall, 2002
4. R. Jacob Baker, CMOS Circuit Design, Layout, and Simulation, 3rd Edition, Wiley, 2010.

ANNAMACHARYA UNIVERSITY

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

RAJAMPET, YSR District, AP – 516126, INDIA

Title of the Course : MICRO ELECTRONICS
Course Code : 26CECE0ET
Course offered to : ECE
Credits : 4

Course Objectives

1. Explain the analysis and design of sequential networks and the characteristics of logic families.
2. Describe operational-amplifier models, limitations, nonideal effects, and applications.
3. Explain CMOS amplifier building blocks and common CMOS amplifier configurations.
4. Analyze digital IC functions and circuits using CMOS and TTL logic families.
5. Introduce VLSI digital-design building blocks and their implementation.

Course Outcomes:

1. Analyze sequential networks and compare the characteristics of digital logic families.
2. Explain operational-amplifier limitations, models, and selected linear-IC applications.
3. Describe CMOS transconductance amplifiers and single-ended, telescopic, cascode, and folded-cascode structures.
4. Explain digital IC interfaces and the design of code converters, decoders, demultiplexers, and related circuits.
5. Describe VLSI digital-design building blocks, including multiplexers, demultiplexers, encoders, and comparators.

Unit 1 Analysis and Design of Sequential Networks and Logic Families 10

Analysis of clock sequential N/Ws, sequential parity checker, analysis of signal tracking & timing charts – state tables & graphs Review of combinational N/W design – design of N/W with limited gating Fan-in. Simulation & testing of logic N/Ws. Logic families: Performance analysis of DTL, DCTL, RTL, TTL, ECL logic families.

Unit 2 Linear ICS 9

DC effects & limitations of OP-amps, low frequency model of OP- AMP, input & output impedance, gain, noise, offset voltage & currents. Applications of OP- AMPs.

Unit 3 CMOS Amplifiers and Data Converters 10

Building blocks for CMOS amplifiers, CMOS Transconductance amplifier, design of single ended telescopic, cascade, folded cascade & two stage amplifier. Frequency compensation scheme. Fundamentals of data converters, next rate A/D converters (Flash interpolating over sampled A/D & D/A converters

Unit 4 Digital ICS 9

CMOS open drain & Tri-state outputs. CMOS Transmission gate. Design using TTL 74XX & CMOS 40XX series of code converters, decoders, de-multiplexers, priority encoders, digital arithmetic operations, digital comparators & counters.

Unit 5 VLSI **10**

Building blocks of digital design. Multiplexer, De-multiplexer, encoder, comparator, adder, ALU carry look ahead adder. FPGA Architectures: Channel type of FPGAs- Xlinx, Actel, Structured programmable logic, Altera, computational logic arrays, algotronix, VLSI primitives-bench mark.

Prescribed Textbooks:

1. Operational amplifiers with linear integrated circuits by William D. Stanley LPE Fourth edition
2. Fundamentals of Logic Design By Charles H. Roth ,Jr.,Jaico publications,4Th Ed. 2006.

Reference Books:

1. FPGAs: Old Field & DORF by Prentice Hall.
2. Analog MOS integrated circuits for Signal Processing by R.Gregorian & Temes.
3. Analog VLSI by Mohammed Ismail & Terri Fiez .McGraw-Hill,19994.
4. The Art of Digital design by Processer & Winkel, Prentice Hall,1994.

ANNAMACHARYA UNIVERSITY

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

RAJAMPET, YSR District, AP – 516126, INDIA

Title of the Course	**:**	WIRELESS COMMUNICATIONS & NETWORKS
Course Code	**:**	26CECE0FT
Course offered to	**:**	ECE
Credits	**:**	4

Course Objectives

1. Explain wireless communication fundamentals, cellular concepts, frequency reuse, and system trends.
2. Describe multiple-access techniques including FDMA, TDMA, spread-spectrum methods, and SDMA.
3. Explain Mobile IP operation and wireless application protocols.
4. Describe mobile data networks including CDPD, GPRS, and mobile messaging services.
5. Explain ad-hoc wireless network architecture, applications, and MAC protocols.

Course Outcomes:

1. Describe wireless communication systems and explain cellular frequency reuse and related concepts.
2. Compare FDMA, TDMA, FHMA, CDMA, hybrid spread spectrum, and SDMA techniques.
3. Explain Mobile IP operation and the role of wireless application protocols.
4. Describe CDPD, GPRS, higher data-rate services, and mobile messaging.
5. Explain the architecture, applications, and MAC protocols of ad-hoc wireless networks.

Unit 1 Wireless Communications & System Fundamentals 10

Introduction to wireless communications systems, examples, comparisons & trends, Cellular concepts- frequency reuse, strategies, interference & system capacity, trucking & grade of service, improving coverage &capacity in cellular systems.

Unit 2 Multiple Access Techniques for Wireless Communication 12

FDMA, TDMA, SSMA (FHMA/CDMA/Hybrid techniques), SDMA technique (AS applicable to wireless communications). Packet radio access-protocols, CSMA protocols, reservation protocols, capture effect in packet radio, capacity of cellular systems. Wireless Networking: Introduction, differences in wireless & fixed telephone networks, traffic routing in wireless networks –circuit switching, packet switching X.25 protocol. Wireless data services – cellular digital packet data (CDPD), advanced radio data information systems, RAM mobile data (RMD). Common channel signalling (CCS), ISDN-Broad band ISDN & ATM, Signalling System no .7 (SS7)-protocols, network services part, user part, signalling traffic, services & performance.

Unit 3 Mobile IP a nd Wireless Application Protocol 10

Mobile IP Operation of mobile IP, co-located address, Registration, Tunnelling, WAP Architecture, overview, WML scripts, WAP service, WAP session protocol, wireless transaction, Wireless datagram protocol. Wireless LAN Technology Infrared LANs, Spread spectrum LANs, Narrow bank microwave LANs, IEEE 802 protocol Architecture, IEEE802 architecture and services,

802.11 medium access control, 802.11 physical layer.

Unit 4 Mobile Data Networks 9

Introduction, Data oriented CDPD Network, GPRS and higher data rates, short messaging service in GSM, Mobile application protocol.

Unit 5 Ad-Hoc Wireless Networks 10

Cellular and Adhoc wireless networks, applications, MAC protocols, Routing, Multicasting, Transport layer Protocols, quality of service browsining, deployment considerations, Adhoc wireless Internet.

Prescribed Textbooks:

1. Wireless Communication and Networking – William Stallings, 2003, PHI.
2. Wireless Communications, Principles, Practice-Theodore, S.Rappaport, 2ndEdn. 2002, PHI.

Reference Books:

1. Wireless Digital Communications – Kamilo Feher, 1999, PHI.
2. Telecommunication System Engineering – Roger L. Freeman, 4/ed., Wiley-Interscience, John Wiley & Sons, 2004.
3. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, 2002, PE

ANNAMACHARYA UNIVERSITY

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

RAJAMPET, YSR District, AP – 516126, INDIA

Title of the Course	**:**	MICROWAVE ANTENNAS
Course Code	**:**	26CECE0GT
Course offered to	**:**	ECE
Credits	**:**	4

Course Objectives

1. Explain antenna parameters including radiation patterns, power density, intensity, gain, efficiency, and bandwidth.
2. Describe the principles and configurations of plane and corner reflector antennas.
3. Analyze two-element and N-element antenna arrays with different amplitude and phase distributions.
4. Explain the structure, advantages, and design considerations of microstrip antennas.
5. Describe rectangular microstrip patch antenna operation and its analysis.

Course Outcomes:

1. Define and explain key antenna parameters and radiation characteristics.
2. Describe reflector antenna configurations and their operating principles.
3. Analyze radiation patterns of two-element and N-element linear arrays.
4. Explain microstrip antenna construction, advantages, and limitations.
5. Describe the analysis and radiation characteristics of rectangular microstrip patch antennas.

Unit 1 Introduction to Antenna Parameters 10

Introduction, Antenna Parameters, Radiation Patterns, Radiation Power Density, Radiation Intensity, Gain, Antenna, Efficiency, Bandwidth, Polarization, Input Impedance, Antenna Radiation Efficiency, Antenna as aperture, Directivity and maximum Aperture, Friis Transmission Equation, Antenna Temperature.

Unit 2 Reflector Antennas 9

Number Plane Reflector, Corner Reflector, 90̊ Corner Reflector, Other Corner Reflectors, Parabolic Reflector, Front-Fed Parabolic Reflector, Cassegrain Reflectors, Lens Antennas, Lenses with n>1, Lenses with n<1, Lenses with Variable Index of Refraction.

Unit 3 Antenna Arrays 10

Introduction, Two Element Array, N-Element Linear Array- Uniform amplitude and Spacing, Broadside Array, Ordinary End-Fire Array, Phased Array, Hansen-Woodyard End-Fire Array, N-Element Linear Array- Directivity, Non-uniform Amplitude, Binomial Array-Design equations

Unit 4 Microstrip Antennas 9

Introduction-Definition of Microstrip antenna, advantages and disadvantages of Microstrip antennas, applications, Radiation mechanism and Radiation fields of Microstrip antennas, excitation techniques.

Unit 5 Rectangular Microstrip Patch Antennas 9

Introduction, Analysis of Rectangular patch radiators, the cavity model, Model Expansion Model, the transmission line model, Bandwidth Enhancement Techniques.

Prescribed Textbooks:

1. Antennas by J.D. Kraus MC Graw-Hill, ISE, 1988.
2. Antenna theory analysis and Design by Constantine A. Balanis, John Wiley.

Reference Books:

1. Microstrip antennas by J.J. Bahl and Bhartia, Artech House, 1982.
2. Microwave Antenna – Theory and Design by Samuel Silver, IEE Press, London 1984.
3. Microstrip Antenna – Theory and Design by James J. Hall, P.S. Wood, 1981.