IV B.Tech I Semester

15AEC54-DIGITAL IMAGE PROCESSING
(CBCC (DEPARTMENTSPECIFIC))

L	T	P	C
3	1	0	3

Course Objectives:

1. To learn the fundamentals of Image Processing.
2. To learn sampling and reconstruction procedures.
3. To learn the various transforms used in image Processing.
4. To study various concepts of image enhancement, reconstruction and image compression.
5. To design image processing systems.

UNIT-1:

DIGITAL IMAGE FUNDAMENTALS: Elements of digital image processing systems, An image model, Basic relationships between pixels and basic transformation, Image acquisition, sampling and quantization, Image file formats Two dimensional convolution, Two dimensional correlation, Two dimensional frequency responses.

Image Transforms: Study analysis with examples of 2D transforms, Transforms: DFT, DCT, Discrete Sine, Walsh, Hadamard, Slant, Haar, KLT, Radon, Hough, and Wavelet

UNIT-2:

IMAGE ENHANCEMENT: Image enhancement through – point processing, Histogram processing, spatial filtering, Enhancement in frequency domain, image smoothing, image sharpening

UNIT-3:

IMAGE RESTORATION: Noise distributions, Degradation model, Unconstrained and constrained restoration, Inverse filtering, minimum mean square error (Wiener) filtering, Constrained least square restoration

UNIT-4:

IMAGE SEGMENTATION AND RECOGNITION: Edge detection, Image segmentation: Region growing, Region splitting and merging, Edge linking, Morphological operations: Dilation, Erosion, Opening, Closing, Image recognition: Patterns and pattern classes, Matching by minimum distance classifier, Statistical classifier, Matching by correlation.

UNIT-5:

IMAGE COMPRESSION: Need for image compression, Image coding, Huffman coding, Run length encoding, Arithmetic encoding, Vector Quantization, Block truncation coding, Transform coding: DCT, Wavelet, Image compression standards

Course Outcomes: *After completion of the course, the student can able to*

a. *Develops ability to identify, formulate &solve problems involving images.*
b. *Develops ability to design &conduct experiments, analyze &interpret image data.*
c. *To design a software, Component or process as per needs &specifications.*
d. *It will demonstrate the skills to use modern engineering tools, software's &equipment to analyze problems.*
e. *Develop confidence for self-education & ability for life-long learning.*
f. *It will show the ability to participate & try to succeed in competitive Exams.*

TEXT BOOKS:

1. R. C. Gonzalez & R.E. Woods, "Digital Image Processing", 3rd Edition, Addison Wesley/Pearson education, 2010.
2. A. K. Jain, "Fundamentals of Digital Image processing", PHI, 1994.

REFERENCES:

1. Rafael C. Gonzalez, Richard E woods and Steven L. Eddins, "Digital Image processing using MATLAB", 2nd Edition, Tata McGraw Hill, 2010.
2. William K. Pratt, "Digital Image Processing", 3rd Edition, John Wilely, 2004.

IV B.Tech I Semester

15AEC55-DSP PROCESSORS & ARCHITECTURES
(CBCC (DEPARTMENTSPECIFIC))

L	T	P	C
3	1	0	3

Course Objectives:

1. To understand the concept of DSP Architecture & comparison of this with that of microprocessors.
2. To understand addressing modes, instruction sets , pipelining and application programs in TMS320C54XX processor
3. To understand the architectural issues of programmable DSP devices and their relationship to the algorithmic requirements, architectures of commercially popular programmable devices and the use of such devices for software development and system design
4. To highlight the suitability of programmable DSP devices for various application areas and motivate to design systems around these devices.

UNIT-I

Introduction to Digital Signal Processing: 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, Analysis and Design tool for DSP Systems MATLAB, DSP using MATLAB.

Computational Accuracy in DSP Implementations: 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 errors, D/A Conversion Errors, Compensating filter.

UNIT-II

Architectures for Programmable DSP Devices: 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.

Execution Control and Pipelining: Hardware looping, Interrupts, Stacks, Relative Branch support, Pipelining and Performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects, Pipeline Programming models.

UNIT-III

Programmable Digital Signal Processors : Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, 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-IV

Implementations of Basic DSP Algorithms : The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, 2-D Signal Processing.

Implementation of FFT Algorithms : An FFT Algorithm for DFT Computation, A Butterfly Computation, Overflow and scaling, Bit-Reversed index generation, An 8-Point FFT implementation on the TMS320C54XX, Computation of the signal spectrum.

UNIT-V

Interfacing Memory And I/O Peripherals to Programmable DSP Devices: Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA). A Multichannel buffered serial port (McBSP), McBSP Programming, a CODEC interface circuit, CODEC programming, A CODEC-DSP interface example.

Course Outcomes: After completion of the course, the student can able to

a. To become familiar with fundamentals of DSP Processors & architectures.
b. To gain in knowledge about the different types of processors and their operation.
c. Will demonstrate the ability to design a system component or process as per needs & specifications.
d. Will demonstrate the ability to identify, formulate & solve engineering problems.

TEXT BOOKS:

1. Avtar Singh and S. Srinivasan, "Digital Signal Processing Implementation", 1st Edition, Cengage Learning, 2004.
2. Lapsley et al. S. Chand & Co, "DSP Processor Fundamentals, Architectures & Features", 2000.

REFERENCES:

1. B. Venkata Ramani and M. Bhaskar, "Digital Signal Processors, Architecture, Programming and Applications", TMH, 2004.
2. Jonatham Stein, "Digital Signal Processing: A Computer Science Perspective", John Wiley, 2000.

IV B.Tech I Semester

15AEC56-CYBER SECURITY
(CBCC (DEPARTMENTSPECIFIC))

L	T	P	C
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Course Objectives:

1. To study essential concepts for cyber security , cyber security applications, cyber crimes, unauthorized crimes and hacking
2. To gain an understanding of terms commonly used in Cyber Security such as "vulnerability"
3. To study various network defence tools like firewalls and Network address translation, Packet filters etc.
4. To study prohibited action on cyber policies, evaluation of crime scene, evidence collection, cyber security law and policies.
5. To understand the cyber crime investigation.

UNIT-1: Systems Vulnerability Scanning

Overview of vulnerability scanning, Open Port/Service Identification, Banner/Version Check, Traffic Probe, Vulnerability Probe, Vulnerability Examples, OpenVAS, Metasploit. Networks Vulnerability Scanning - Netcat, Socat, understanding Port and Services tools - Datapipe, Fpipe, WinRelay, Network Reconnaissance – Nmap, THC-Amap and System tools. Network Sniffers and Injection tools – Tcpdump and Windump, Wireshark, Ettercap, Hping Kismet

UNIT-2: Network Defense tools

Firewalls and Packet Filters: Firewall Basics, Packet Filter Vs Firewall, How a Firewall Protects a Network, Packet Characteristic to Filter, Stateless VsStateful Firewalls, Network Address Translation (NAT) and Port Forwarding, the basic of Virtual Private Networks, Linux Firewall, Windows Firewall, Snort: Introduction Detection System

UNIT-3: Web Application Tools

Scanning for web vulnerabilities tools: Nikto, W3af, HTTP utilities - Curl, OpenSSL and Stunnel, Application Inspection tools – Zed Attack Proxy, Sqlmap. DVWA, Webgoat, Password Cracking and Brute-Force Tools – John the Ripper, L0htcrack, Pwdump, HTC-Hydra

UNIT-4: Introduction to Cyber Crime and law

Cyber Crimes, Types of Cybercrime, Hacking, Attack vectors, Cyberspace and Criminal Behavior, Clarification of Terms, Traditional Problems Associated with Computer Crime, Introduction to Incident Response, Digital Forensics, Computer Language, Network Language, Realms of the Cyber world, A Brief History of the Internet, Recognizing and Defining Computer Crime, Contemporary Crimes, Computers as Targets, Contaminants and Destruction of Data, Indian IT ACT 2000.

UNIT-5: Introduction to Cyber Crime Investigation

Firewalls and Packet Filters, password Cracking, Keyloggers and Spyware, Virus and Warms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow, Attack on wireless Networks

Course Outcomes: After completion of the course, the student can able to

a. Possess a fundamental knowledge of Cyber security.

b. Understand what vulnerability is and how to address most common vulnerabilities.

c. Understand basic technical controls in use today, such as firewalls and Intrusion Detection systems.

d. Understand cyber policies, Evaluation of Crime scene, evidence collection, Cyber security law and policies and cyber crime investigation.

Text Books:

1. Anti-Hacker Tool Kit (Indian Edition) by Mike Shema, Publication McGraw Hill.
2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole and SunitBelpure, Publication Wiley

Reference Books:

1. James Graham, Ryan Olson, "Cyber Security Essentials," 1st Edition, Auerbach Publications, 2010.
2. Anthony Reyes, Richard Brittson, Keving O'Shea, James Steele, "Cyber Crime Investigations: Bridging the Gaps between Security Professional, Law Enforcement, and Prosecutors," 1st Edition, Syngress Publishing, 2007.

IV B.Tech I Semester

15AEC57-BIO-MEDICAL INSTRUMENTATION
(CBCC (DEPARTMENT SPECIFIC))

L	T	P	C
3	1	0	3

Course Objectives:

1. To understand the functioning of Human Cell and its electrical characteristics.
2. To get Sufficient knowledge about Cardiovascular measurement and circulatory System of heart.
3. To get familiarize with pace makers and Defibrillators.
4. To understand about the electrical hazards that may occur during the usage of medical instruments.

UNIT-I

Human cell and its Electrical characteristics neuron and impulses, Recording Electrodes – Electrode-Electrolyte interface, polarizable – Non-polarizable Electrodes, body surface recording Electrodes, internal Electrodes, Micro Electrodes, Electrode array & Practical hints in using Electrodes.

UNIT-II

Bioelectric potential and cardiovascular measurement circulatory system of heart – ECG Anatomy & Function of heart abnormal cardiac Rhythms – Arrhythmias – Einthoven triangle. EEG recording system (10-20 electrode System) Biorhythms – Sleep pattern

UNIT-III

Therapeutic and prosthetic devices, Cardiac pace maker, Types – Asynchronous and Synchronous modes of operation (Demand). Asynchronous pace maker – Working principle and Function demand PM – Working principle – QRS triggered and atrioventricular Synchronized PM lead wires and Electrodes, Cardioverter.

Defibrillator : Working principle of DC Defibrillation Electrodes used. Infant incubator and Lithotripry.

UNIT-IV

Electrical Hazards in medical instruments macro and micro shock – devices to protect against electrical hazards – Ground fault interrupter, isolation transformer, line isolation monitor, receptacle tester, electrical safety analyzer equipment, preventive maintenance.

UNIT-V

Image Systems: Introduction, Basic principle and block diagram of x-ray machine, x-ray computed topography (C.T. Scanner) and Nuclear Magnetic resonance (NMR) Short-wave Diathermy, Microwave Diathermy, Ultrasound Therapy unit.

Recent trends: Ultrasonography -Introduction, medical ultrasound, block diagram of pulse echo-system, A-Scan, M-mode, B-scanner and real time ultrasound imaging systems – lasers principle and operation of laser types of lasers – Pulsed Ruby laser – ND-YAG laser – Helium –Neon laser-Argon laser-C02 laser exciner laser, Semiconductor lasers – Laser safety.

Course Outcomes: After completion of this course the student will be able to

a. Explain the functioning of Human Cell and its electrical characteristics
b. Acquire knowledge about Cardiovascular measurement and circulatory System of heart
c. Familiarize with pace makers and Defibrillators
d. Know about the electrical hazards that may occur during the usage of medical instruments

Text Books:

1. John G.Webser, "Medical Instrumentation Applications and Design," 3rd Edition, John Wiley & Sons, 1998.
2. Seslie Cromwell, Fred J.Weibell, EsichA.Plefittes, "Bio-Medical Instrumentation & measurements", 9th Edition, Pearson Education, 2007.

References:

1. RS Khandpur, "Handbook of BioMedical Instrumentation", 2nd Edition, Tata McGraw Hill, 1992.
2. Walter Welko- Witiz and Sid Doutsch, "Biomedical Instruments: Theory and Design," 2nd Edition, PHI, 1992.

IV B.Tech I Semester

15AEC58-SATELLITE COMMUNICATIONS
(CBCC (DEPARTMENT SPECIFIC))

L	T	P	C
3	1	0	3

Course Objectives:

1. *To introduce the basic principles of Satellite Communication systems, orbital mechanics, launchers.*
2. *To introduce the basic concepts and designing of Satellite links.*
3. *To introduce the basic concepts of earth station transceiver.*
4. *To know the basic concepts of various multiple access techniques and GPS systems.*

UNIT-I

INTRODUCTION TO SATELLITE COMMUNICATIONS:

Origin of satellite communications, basic concepts of satellite communications, frequency allocations for satellite services, applications, future trends of satellite communications.

Orbital Mechanics look angle determination, orbital perturbations, orbit determination, launches and launch vehicles, orbital effects in communication systems performance.

UNIT-II

SATELLITE SUBSYSTEMS AND LINK DESIGN:

Attitude and orbital control system, Telemetry, Tracking, command and monitoring, power systems, communication subsystems, satellite antenna equipment reliability and space qualification.

Basic transmission theory, system noise temperature and G/T ratio, design of down links, uplink design, design of satellite links for specified C/N, system design example.

UNIT-III

EARTH STATION TECHNOLOGY:

Introduction, transmitters, receivers, Antennas, tracking systems, terrestrial interface, primary power test methods, comparison of LEO and GEO satellite systems in real world.

UNIT-IV

MULTIPLE ACCESS:

Frequency division multiple access (FDMA), Intermodulation, calculation of C/N, Time Division multiple access (TDMA) frame structure, examples. Satellite switched TDMA onboard processing, DAMA, code division multiple access (CDMA), spread spectrum transmission and reception.

UNIT-V

SATELLITE NAVIGATION & THE GLOBAL POSITIONING SYSTEM:

Radio and satellite navigation, GPS position location principles, GPS receivers and codes, satellite signal acquisition, GPS navigation message, GPS signal levels, GPS receiver operation, GPS C/A code accuracy, differential GPS.

Course Outcomes:

a. *Students can determine the location of Satellite.*
b. *Students can design satellite uplink and downlink.*
c. *Students can design earth station transmitter, receiver and antenna systems.*

TEXT BOOKS:

1. Timothi Pratt, Charles Bostian and Jeremy Allnutt, "Satellite communications", 2nd Edition, WSE, Wiley publications, 2003.
2. Wilbur L.Prichard, Robert A. Nelson & Henry G.Suyderhoud, "Satellite communications Engineering", 2nd Edition, Pearson Publications, 2003.

REFERENCES:

1. Dennis Roddy, "Satellite communications", 2nd Edition, McGraw Hill, 1996.
2. K.N.RajaRao, "Fundamentals of Satellite communications", PHI, 2004.

IV B.Tech I Semester

15AEC59-ADVANCED DSP
(CBCC (DEPARTMENT SPECIFIC))

L	T	P	C
3	1	0	3

Course Objectives:

a. To Understand the techniques of modern signal processing that are fundamental to a wide variety of application areas.
b. To know the mathematical basis of discrete time signal analysis, discuss the theory and implementation of FFT algorithms, digital filters.
c. To Understand the discrete Fourier transform (DFT), its applications and its implementation by FFT techniques. Gain some knowledge of the 2-D FFT and its application to image processing and compression.

UNITI

LTI DISCRETE-TIME SYSTEMS IN THE TRANSFORM DOMAIN: Types of Linear-Phase transfer functions, Simple Digital Filters, Complementary Transfer Function, Inverse Systems, System Identification, Digital Two-Pairs, Algebraic Stability Test.

UNITII

DIGITAL FILTER SRTUCTURE AND DESIGN: All Pass Filters, Tunable IIR Digital Filter, IIR Tapped Cascade Lattice Structures, FIR Cascaded Lattice Structures, Parallel All Pass Realization of IIR Transfer Functions, State Space Structures, Polyphase Structures, Digital Sine-Cosine Generator, Computational Complexity of Digital Filter Structures, Design of IIR Filter using pade' approximation, Least Square Design Methods, Design of Computationally Efficient FIR Filters.

UNITIII

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

UNIT IV

POWERSPECTRALESTIMATION:Estimationofspectrafromfinitedurationobservationofsignals, Non-parametric methods: Bartlett, Welch & Blackmann & Tukey methods.

PARAMETRICMETHODSFORPOWERSPECTRUMESTIMATION:Relationbetweenautocorrelation &modelparameters,Yule-Waker&BurgMethods,MA&ARMAmodelsforpowerspectrumestimation.

UNITV

ANALYSIS OF FINITE WORD LENGTH EFFECTS INFIXED-POINT DSP SYSTEMS: Fixed, Floating Point Arithmetic–ADC quantizationnoise&signalquality-FinitewordlengtheffectinIIRdigitalFilters–Finiteword-length effects in FFT algorithms.

APPLICATIONS OF DIGITAL SIGNAL PROCESSING: Dual Tone Multi-frequency Signal Detection, Spectral Analysis of Sinusoidal Signals, Spectral Analysis of Non stationary Signals, Musial Sound Processing.

Course Outcomes: After completion of the course, the student can able to

a. Comprehend the concepts of Linear Time Invariant system.
b. Design and analyze the digital filters .
c. Understand the concepts of power spectral and estimation.
d. Understand the basics of multi rate digital signal processing.

TEXTBOOKS:

1. Sanjit K Mitra, "DigitalSignalProcessing: A Computer Based Approach," 4th Edition, McGraw Hill International, 2011.
2. J G Proakis, D G Manolokis, "DigitalSignalProcessing Principles, Algorithms, Applications," 4th Edition, PHI, 2006.

REFERENCES:

1. A V Oppenhiem, R W Schafer, "Discrete-Time Signal Processing," 3rd Edition, Pearson Education, 2010.
2. Emmanuel C Ifeacher Barrie. W. Jervis, "DSP- A Practical Approach," PHI, 2002.