

**KRISHNA UNIVERSITY COLLEGE OF ENGINEERING &
TECHNOLOGY**

B.TECH. – ECE
Course Structure (R23) – IV year-I Semester

S.No.	Course Code	Category	Title	L	T	P	Credits
1	23EC701	Professional Core	Cellular and Mobile Communications	3	1	0	3
2	23EC702	Management Course- II	Human Resources & Project Management	2	0	0	2
3	23EC703A 23EC703B 23EC703C	Professional Elective-IV	1. DSP Processors & Architectures 2. CMOS Analog IC Design 3. Satellite Communications	3	0	0	3
4	23EC704A 23EC704B 23EC704C	Professional Elective-V	1. Bio Medical Signal Processing 2. Digital Image Processing 3. Radar Engineering	3	0	0	3
5	23EC705A 23EC705B 23EC705C	Open Elective-III	1. Internet of Things 2. Web Technologies 3. Cyber Security	3	0	0	3
6	23EC706A 23EC706B 23EC706C	Open Elective-IV	1. Multimedia and its Applications 2. Software Engineering 3. Cloud Computing	3	0	0	3
7	23EC707	Skill Enhancement Course	Industrial IoT & Automation	0	1	2	2
8	23EC708	Audit Course	Constitution of India	2	0	0	-
9	23EC709	Internship	Evaluation of Industry Internship	-	-	-	2
		Total		19	2	2	21

B

S.No.	Course Code	Category	Title	L	T	P	Credits
1	23EC801P	Internship & Project Work	Full semester Internship & Project Work	0	0	24	12

KRISHNA UNIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGY
B. TECH(ECE) IV-VII SEM

IV YEAR-VII SEM		L	T	P	C
		3	0	0	3
CELLULAR AND MOBILE COMMUNICATIONS					

Course Objectives:

- To explain cell coverage for signal and traffic, diversity techniques and mobile antennas by the use of Engineering Mathematics.
- To present impairments due to multipath fading channel fundamental techniques to overcome different fading effects, frequency management, Channel assignment and types of handoffs.
- To teach concepts and solve problems on mobile antennas and cellular systems

Course Outcomes:

- know about cell coverage for signal and traffic, diversity techniques and mobile antennas by the use of Engineering Mathematics
- Explain impairments due to multipath fading channel, fundamental techniques to overcome different fading effects, frequency management, Channel assignment and types of handoff
- Apply concepts to solve problems on mobile antennas and cellular systems
- Analyze Co-channel and Non Co-channel interferences different Hand-offs and dropped call rates
- Evaluate performance of dropped call rate and false alarm rate
- Compare different handoffs

UNIT –I

Introduction to Cellular Mobile Radio Systems: Limitations of Conventional Mobile Telephone Systems, Basic Cellular Mobile System, Uniqueness of Mobile Radio Environment, Mobile Fading Characteristics, Operations of Cellular Systems, Evolution of Cellular Systems.

Fundamentals of Cellular Radio System Design: Concept of Frequency Reuse, Co-Channel Interference, Co-Channel Interference Reduction Factor, Desired C/I from a Normal Case in an Omni Directional Antenna System, System Capacity, ring, Microcell Zone Concept.

UNIT –II

Cell Coverage for Signal and Traffic: Signal Reflections in Flat and Hilly Terrain, Effect of Human Made Structures, Phase Difference between Direct and Reflected Paths, Constant Standard Deviation, Straight Line Path Loss Slope, General Formula for Mobile Propagation Over Water and Flat Open Area, Near and Long Distance Propagation, Path Loss from a Point to Point Prediction Model in Different Conditions, Merits of Lee Model.

Cell Site and Mobile Antennas: Space Diversity Antennas, Umbrella Pattern Antennas, Minimum Separation of Cell Site Antennas, Mobile Antennas.

UNIT – III

Co-Channel Interference Reduction: Measurement of Real Time Co-Channel Interference, Design of Omnidirectional and directional Antenna System, Antenna Parameters and Their Effects, Diversity Techniques-Space Diversity, Polarization Diversity, Frequency Diversity, Time Diversity.

Non-Co-Channel Interference: Adjacent Channel Interference, Near End Far End Interference, Cross Talk, Effects on Coverage and Interference by Power Decrease, Antenna Height Decrease, Effects of Cell Site Components.

UNIT – IV

Frequency Management and Channel Assignment: Numbering and Grouping, Setup Access and Paging Channels, Channel Assignments to Cell Site and Mobile Units, Channel Sharing and Borrowing, Sectorization, Overlaid Cells, Non Fixed Channel Assignment

UNIT – V

Handoffs and Dropped Calls: Handoff Initiation, Types of Handoff, Delaying Handoff, Advantages of Handoff, Power difference Handoff, Forced Handoff, Mobile Assisted and Soft Handoffs, Intersystem Handoff, Introduction to Dropped Call Rates and their Evaluation.

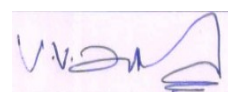
System Evaluation: Performance Evaluation, Blockage, Dropped-call rate, Signaling Evaluation-False Alarm Rate, Word error rate consideration and calculations, Measurement of averaged received signal level and level crossings.

Textbooks:

1. W.C.Y. Lee Mobile Cellular Telecommunications, McGraw Hill, 2nd Edn., 1989.
2. Theodor S. Rappoport Wireless Communications, Pearson Education, 2nd Edn., 2002.

References:

1. W.C.Y. Lee Mobile Communications Engineering- Theory and Applications, McGraw Hill Second Edition, 2014.
2. Gordon L. Stuber, Principles of Mobile Communications, Springer International, 2nd Edn., 2001.
3. Simon Haykin, Michael Moher, Modern Wireless Communications, Pearson Education, 2005.



KRISHNA UNIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGYB.
TECH(ECE) IV-VII SEM

IV YEAR-VII SEM		L	T	P	C
		2	0	0	2
HUMAN RESOURCES AND PROJECT ADMINISTRATION (Management Course-II)					

Course Objectives:

- To provide students with a foundational understanding of Human Resource Management concepts and functions relevant to organizational effectiveness.
- To develop knowledge of human resource development practices, performance appraisal, and compensation systems in organizations.
- To familiarize students with basic principles, tools, and techniques of Project Management for planning, implementation, and evaluation of projects.

Course Outcomes:

Upon successful completion of the course, the students will be able to

- understand and explain the nature, scope, functions, and planning processes of Human Resource Management in organizations.
- apply Human Resource Development practices including training, performance appraisal, and career development in organizational settings.
- analyze performance appraisal systems and compensation structures for effective employee management.
- identify different types of projects and explain basic project planning concepts, project environment, and project life cycle.
- demonstrate understanding of project implementation, control, appraisal, and review techniques for evaluating project success.

UNIT – I

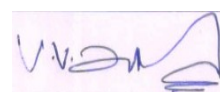
Human Resource Management: Nature, scope, and concept of Human Resource Management - Functions of HRM and role of the HR Manager - Emerging trends in HRM and E-HRM - Human Resource Planning: demand and supply forecasting - Job design, job analysis - Recruitment: sources of recruitment - Selection: selection procedure.

UNIT - II

Human Resource Development: Concept of Human Resource Development (HRD) - Training and Development: concept, objectives, and methods of training - Career development and counselling - Human Resource Accounting: concept and models.

UNIT - III

Performance Appraisal and Compensation: Performance Appraisal: process, and methods - Compensation: concept and importance. Components of compensation, Concept and importance of employee relations.

UNIT - IV

Basics of Project Management: Concept and importance of Project Management - Project environment and types of projects - Project Life Cycle - Project proposals and Detailed Project Report (DPR) - Pareto Principle (80-20 rule) - Project networks: types.

UNIT - V

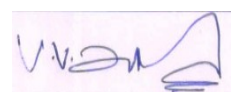
Project Implementation and Review: Project implementation: forms of project organization - Project planning and control - Project review, performance evaluation and abandonment analysis - Prerequisites for successful project implementation.

Textbooks

1. Human Resource Management: Text and Cases - K. Aswathappa, McGraw-Hill Education, India, Revised Edition, 2021, ISBN: 9789354608933
2. Projects: Planning, Analysis, Selection, Financing, Implementation, and Review - Prasanna Chandra, McGraw-Hill Education, India, 10th Edition, 2023, ISBN: 9789355320667
3. Human Resource Management: Text and Cases - V.S.P. Rao, Excel Books, New Delhi, 2007, ISBN: 9788174464316

Reference Books

1. Essentials of Human Resource Management and Industrial Relations - P. Subba Rao, Himalaya Publishing House, Mumbai, 5th Edition, 2010, ISBN: 9789350244548
2. Project Management - Vasant Desai, Himalaya Publishing House, 4th Edition, 2018, ISBN: 9789352734658
3. Project Management - Lalitha Balakrishnan Gowri, Himalaya Publishing House, New Delhi, 2022, ISBN: 9789355961358



**KRISHNA UNIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGYB.
TECH(ECE) IV-VII SEM**

DSP PROCESSORS & ARCHITECTURES.

CourseObjectives:

- To describe unique features of Digital signal processing.
- To demonstrate various computational parameters of DSP devices.
- To introduce architectural improvements in programmable DSP devices.
- To expose to basic DSP algorithms.
- To outline DSP processors for developing various applications.

CourseOutcomes:

- Summarize features of Digital Signal Processing
- Evaluate dynamic ranges and precision for the given DSP system
- Explain architectural features of DSP processors
- Analyze performance of DSP algorithms on programmable DSP platform for given application
- Select DSP processors for building real time applications

UNIT - I

Introduction to Digital Signal Processing: 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 - II

Computational Accuracy in DSP Implementations: Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of Error in DSP Implementation, A/D Conversion Errors, D/A Conversion Errors

UNIT - III

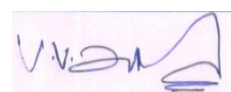
Architecture for Programmable DSP Devices: DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Programmability and Program Execution, Speed Issues, Commercial Digital Signal Processing Devices, Data Addressing Modes of TMS320C54xx Processors, Memory space of TMS320C54xx Processors, TMS320C54xx Instructions and Programs

UNIT - IV

Implementation of Basic DSP Algorithms: The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, PID Controller, Adaptive Filters, 2-D Signal Processing, An FFT Algorithm for DFT Computation, A Butterfly Computation, Bit Reversed Index Generation, 4-point FFT Implementation on the TMS320C54xx, Computation of the Signal Spectrum

UNIT - V

Applications of Programmable DSP Devices: A DSP System, DSP Based Biotelemetry Receiver, A Speech Processing System, An Image Processing System.

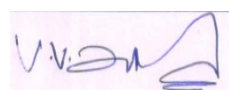


Textbooks:

1. B.Venkataramani and M.Bhaskar, Digital Signal Processors, Architecture Programming and Applications, TMH, 2002.
2. Avtar Singh and S.Srinivasan, Digital Signal Processing, Thomson Publications, 2004.

References:

1. J.G.Proakis, Algorithms for Statistical Signal Processing, Pearson, 2002.
2. Jonathan Stein, Digital Signal Processing, John Wiley, 2005.
3. K Padmanabhan, R. Vijayarajeswaran, Ananthi. S, A Practical Approach to Digital Signal Processing. New Age International, 2006/2009
4. Lapsley et al DSP Processor Fundamentals-Architectures & Features, S. Chand & Co., 2002



**KRISHNA UNIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGYB.
TECH(ECE) IV-VII SEM**

CMOS ANALOGIC DESIGN

Course Objectives:

- Understand the behaviour of MOS Devices and Small-Signal & Large-Signal Modelling of MOS Transistor and Analog Sub-Circuits.
- Learn and understand CMOS Amplifiers like Differential Amplifiers, Cascode Amplifiers, Output Amplifiers, and Operational Amplifiers.
- Design and Develop the Analog CMOS Circuits for different Analog operations.

Course Outcomes:

- Understand the behavior of MOS Devices.
- Characterize two stage and open loop Comparators.
- Analyze and derive Small-Signal and Large-Signal Modelling of MOS Transistors for analog applications like Differential amplifiers, current amplifiers, inverters.
- Design current mirror circuits using MOSFETs and CMOS amplifier circuits for real time amplification applications.
- Develop Op-Amp based analog circuits.

UNIT-I

MOS Devices and Modelling: The MOS Transistor, Passive Components- Capacitor & Resistor, Integrated circuit Layout, CMOS Device Modelling- Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Computer Simulation Models, Sub-threshold MOS Model.

UNIT-II

Analog CMOS Sub-Circuits: MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors-Current mirror with Beta Helper, Degeneration, Cascode current Mirror and Wilson Current Mirror, Current and Voltage References, Band gap Reference.

UNIT-III

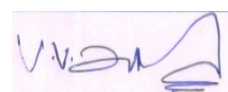
CMOS Amplifiers: Inverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers, High Gain Amplifiers Architectures.

UNIT-IV

CMOS Operational Amplifiers: Design of CMOS Op Amps, Compensation of Op Amps, Design of Two-Stage Op Amps, Power- Supply Rejection Ratio of Two-Stage Op Amps, Cascode Op Amps, Measurement Techniques of OP Amp.

UNIT-V

Comparators: Characterization of Comparator, Two-Stage, Open-Loop Comparators, Other Open-Loop Comparators, Improving the Performance of Open-Loop Comparators, Discrete-Time Comparators.

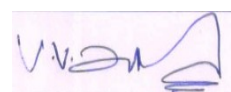


Textbooks:

1. Design of Analog CMOS Integrated Circuits - Behzad Razavi, TMH Edition, Second Edition.
2. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.

References:

1. Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, "Analysis and Design of Analog Integrated Circuits", Wiley India, Fifth Edition, 2010.



KRISHNA UNIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGYB.
TECH(ECE) IV-VII SEM

IV YEAR-VII SEM		L	T	P	C
		3	0	0	3
SATELLITE COMMUNICATIONS					

CourseObjectives:

- To introduce various aspects in the design of system for satellite communication.

CourseOutcomes:

- Learnthedynamics ofthesatellite.
- Understandthecommunicationsatellitedesign.
- Understandhowanaloganddigitaltechnologiesareusedforsatellitecommunicationnetworks.
- Learnthedesigntofsatellitelinks.
- StudythedesigntofEarthstationandtrackingofthesatellites.

UNIT– I

Elementsoforbitalmechanics.Equationsofmotion.Trackingandorbitdetermination.Orbitalcorrection /control. Satellite launch systems. Multistage rocket launchers and their performance.

UNIT–II

Elementsofcommunicationsatellitedesign.Spacecraftsubsystems.Reliabilityconsiderations. Spacecraft integration.

UNIT - III

Multipleaccesstechniques.FDMA,TDMA,CDMA.Randomaccesstechniques.Satelliteonboard processing.

UNIT–IV

Satellite link design: Performance requirements and standards. Design of satellite links – DOMSAT, INSAT, INTELSAT and INMARSAT. Satellite - based personal communication. links.

UNIT–V

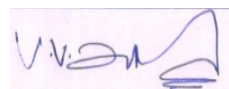
Earthstationdesign. Configurations.Antennaandtrackingsystems.Satellitebroadcasting.

Textbooks:

D.Roddy,SatelliteCommunication(4/e),McGraw-Hill,2009.
T.Pratt&C.W.Bostain,SatelliteCommunication,Wiley2000.

References:

B.N.Agrawal,DesignofGeosynchronousSpacecraft,Prentice-Hall,1986



**KRISHNA UNIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGY B.
TECH(ECE) IV-VII SEM**

BIOMEDICAL SIGNAL PROCESSING

Course Objectives:

- properties and suitable models of important biological signals such as ECG and EEG.
- Interrelate the students' mathematical and computational skills relevant to the field of biomedical signal processing.
- Introduce students to basic signal processing techniques in analyzing biological signals.
- Develop a thorough understanding on basics of ECG signal compression algorithms.
- Increase the student's awareness of the complexity of various biological phenomena and cultivate an understanding of the promises, challenges of the biomedical engineering.

Course Outcomes:

- Understand the origin, properties of biomedical signals like ECG, EEG, PCG, ENG, EOG signals, modern filtering techniques.
- Apply filters to remove noise, signal compression techniques & averaging technique on biomedical signals to extract the Described the origin features of ECE, EEG and EMG signals.
- Analyze the nature of biomedical signals and related concepts, and event detection techniques for ECG, EEG, and EMG signals. Also compare different filtering techniques.
- Develop an interest to simulate the models and validate its functionality in real time systems.

UNIT-I

Concept of Biological signals – Electrical, Mechanical, Chemical, Magnetic, Optical etc. Origin of electrical signal from Biological cell – Structure of Biological cell, Characteristics of Cell membrane, Distribution and movement of ions across the cell membrane, Generation of Biological cell Action Potential. Concept of Electrocardiogram (ECG), Electroencephalogram (EEG), Phonocardiogram (PCG), Electromyogram (EMG), Electroneurogram (ENG), Electrooculogram (EOG), Respiratory signals etc.

UNIT-II

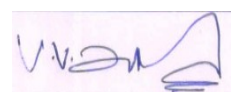
Signal Conditioning: Band limiting of different Biological signals, Representation of biological signals in analog, discrete and digital forms. **Filtering for Removal of artifacts** - Statistical Preliminaries, Time domain filtering - Synchronized Averaging, Moving Average Filter to Integration, Derivative-based operator, **Frequency Domain Filtering** – FIR and IIR methods for implementing Notch, band selective filters, Weiner, Adaptive Filtering concepts.

UNIT-III

Electrocardiogram (ECG) Analysis: Concepts of morphological and rhythm analysis, Different types of arrhythmias, Derivative based Approaches for QRS Detection, PanTompkins Algorithm, Concepts of detecting the P, T waves, PR, ST intervals, QRS duration, etc. Heart Rate Variability (HRV) study and its importance.

UNIT-IV

EEG, EMG signals Analysis: Basics of EEG and EMG signals. Signal strength, Signal entropy in time and frequency domain, Correlation coefficient, Envelop Extraction, Root Mean Square value, Zero-crossing rate, Form factor, Periodogram, Minimum phase correspondent, Power Spectral Density concepts in analyzing EEG and EMG signals.



UNIT-V

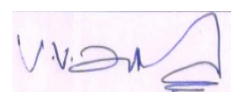
Modelling of Biomedical Systems: Motor unit firing pattern, Cardiac rhythm, Formants and pitch of speech, Point process, Parametric system modelling, Autoregressive model, Autocorrelation method, Application to random signals, Computation of model parameters, Levinson-Durbin algorithm, Computation of gain factor, Covariance method, Spectral matching and parameterization, Model order selection, Relation between AR and Cepstral coefficients, ARMA model, Sequential estimation of poles and zeros.

Textbooks:

1. R MRangayyan "Biomedical Signal Analysis: A case Based Approach", IEEE Press, John Wiley & Sons. Inc, 2002.
2. Willis J. Tompkins, "Biomedical Digital Signal Processing", EEE, PHI, 2004.
3. DC Reddy "Biomedical Signal Processing: Principles and Techniques", Tata McGraw-Hill Publishing Co. Ltd, 2005.

References:

1. Suresh R Devasahayam, "Signals and Systems in Biomedical Engineering: Physiological Systems Modeling and Signal Processing", Springer, 3rd Edition, 2019.
2. JG Webster "Medical Instrumentation: Application & Design", John Wiley & Sons Inc., 2001.



**KRISHNA UNIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGYB.
TECH(ECE) IV-VII SEM**

IV YEAR-VII SEM		L	T	P	C
		3	0	0	3
DIGITAL IMAGE PROCESSING					

Course Objectives:

This course is designed to enable the students to familiarize themselves with basic concepts of digital image processing and different image transforms and learn various image processing techniques like image enhancement, restoration, segmentation and compression

Course Outcomes:

After completion of the course, students will be able to

- Perform image manipulations and different digital image processing techniques
- Illustrate basic operations like – Enhancement, segmentation, compression, Image transforms and restoration techniques on image.
- Analyze pseudo and full color image processing techniques.

Apply various morphological operators on images

UNIT – I

Introduction: Introduction to Image Processing, Fundamental steps in digital image processing, components of an image processing system, image sensing and acquisition, image sampling and quantization, some basic relationships between pixels, an introduction to the mathematical tools used in digital image processing. Image Transforms: Need for image transforms, Discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, some properties of the 2-D Discrete Fourier transform, Importance of Phase, Walsh Transform. Hadamard transform, Haar Transform, Slant transform, Discrete Cosine transform, KL Transform, SVD and Radon Transform, Comparison of different image transforms.

UNIT – II

Intensity Transformations and Spatial Filtering: Background, Some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters, sharpening spatial filters, Combining spatial enhancement methods Filtering in the Frequency Domain: Preliminary concepts, The Basics of filtering in the frequency domain, image smoothing using frequency domain filters, Image Sharpening using frequency domain filters, Selective filtering.

UNIT – III

Image Restoration and Reconstruction: A model of the image degradation / Restoration process, Noise models, restoration in the presence of noise only-Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear, Position –Invariant Degradations, Estimating the degradation function, Inverse filtering, Minimum mean square error (Wiener)

filtering, constrained least squares filtering, geometric mean filter, image reconstruction from projections.

UNIT – IV

Image compression: Fundamentals, Basic compression methods: Huffman coding, Golomb coding, Arithmetic coding, LZW coding, Run-Length coding, Symbol-Based coding, Bit-Plane coding, Block Transform coding, Predictive coding Wavelets and Multiresolution Processing: Image pyramids, subband coding, Multiresolution expansions, wavelet transforms in one dimensions & two dimensions, Wavelet coding.

UNIT – V

Image segmentation: Fundamentals, point, line, edge detection, thresholding, region –based segmentation. Morphological Image Processing: Preliminaries, Erosion and dilation, opening and closing, basic morphological algorithms for boundary extraction, thinning, gray-scale morphology, Segmentation using morphological watersheds.

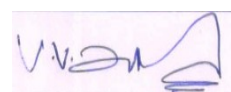
Color image processing: color fundamentals, color models, pseudo color image processing, basics of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression.

Textbooks:

1. R.C.Gonzalez and R.E.Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.
2. Jayaraman, S. Esakkirajan, and T. Veerakumar, "Digital Image Processing", Tata McGraw-Hill Education, 2011.

Reference Books:

1. Anil K. Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 9th Edition, Indian Reprint, 2002.
2. B. Chanda, D. Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2009



**KRISHNA UNIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGY B.
TECH(ECE) IV-VII SEM**

RADAR ENGINEERING

Course Objectives:

- To make student to acquire the knowledge on types of Radars, working principles, tracking a target, applications and understand on phased array antennas, navigational aids

Course Outcomes:

- Learn the basic working principle of Radar and target detection procedure
- Know the working and applications of CW and Frequency modulated Radar
- Gain the knowledge of about MTI and Pulse Doppler Radar
- Understand different methods of tracking a target and analyze the effect of noise at the receiver
- Learn about the phased array antennas and navigational aids

UNIT - I

Basics of Radar: Introduction, Maximum Unambiguous Range, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications, Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Modified Radar Range Equation, Illustrative Problems. Radar Equation: SNR, Envelope Detector, False Alarm Time and Probability, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Displays – types, Illustrative Problems.

UNIT - II

CW and Frequency Modulated Radar: Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar, Illustrative Problems. FM-CW Radar, Range and Doppler Measurement, Block Diagram and Characteristics (Approaching/ Receding Targets), FM-CW altimeter, Multiple Frequency CW Radar.

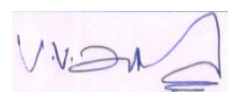
UNIT - III

MTI and Pulse Doppler Radar: Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, And Staggered PRFs. Range Gated Doppler Filters, MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler radar.

UNIT-IV

Tracking Radar: Tracking with Radar Sequential Lobing, Conical Scan, Mono pulse Tracking Radar – Amplitude Comparison Mono pulse (one- and two-coordinates), Phase Comparison Mono pulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

Detection of Radar Signals in Noise: Introduction, Noise Figure and Noise Temperature,



Matched Filter Receiver – Response Characteristics and Derivation, Correlation detection, Detection criteria, Detector Characteristics, Automatic Detection, Constant False Alarm Rate Receiver.

UNIT - V

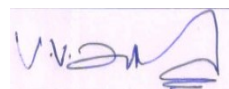
Phased Array Antennas and Navigational Aids: Introduction to Phased Array Antennas- Basic Concepts, Electronically Steered Phased Array Antennas, Phase Shifters, Frequency – scan Arrays, Radiation for Phased Array, Architecture for Phased Arrays. Radiation Pattern. Beam Steering and Beam Width changes. Navigational Aids: Direction Finder, VOR, ILS and Loran.

Textbooks:

1. Merrill. Skolnik, “Introduction to Radar Systems”, 2nd Edition, TMH Special Indian Edition, 2007.
2. Byron Edde, “Radar Principles, Technology, Applications”, Pearson Education, 1992.

References:

1. F.E. Terman, Radio Engineering, McGraw-Hill Book Co. (for Chapter 7 only), 4th Edition 1955
2. Simon Kingsley & Shaun Quegan, Understanding RADAR Systems, Mc. Graw-Hill Book Co., 1993



IV YEAR-VII SEM		L	T	P	C
		3	0	0	3
INTERNET OF THINGS					

Course Objectives:

Students will understand the concepts of Internet of Things and can able to build IoT applications

Course Outcomes:

- Understand the concepts of Internet of Things
- Identify hardware and software components of Internet of Things
- Analyze basic communication protocols
- Design IoT applications in different domain and be able to analyze their performance

UNIT - I

Introduction to IoT: Architectural overview, Design principles and needed capabilities, IoT Applications, Sensing, Actuation, Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gateways, Data management, Business processes in IoT, Role of cloud in IoT.

UNIT - II

Elements of IoT: Hardware components (Arduino), communication, Sensing, Actuation, I/O interfaces Software Components- Programming APIs (Arduino) for communication protocols- MQTT, Zigbee, Bluetooth, CoAP, UDP, TCP.

UNIT - III

Sensing and Actuation: Definition of Sensor, Sensor features, Resolution, Classes, Different types of sensors, Actuator, Different types of Actuators, purpose of Sensors and Actuators in IoT.

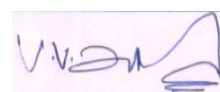
UNIT – IV

IoT Application Development: Solution frame work for IoT Applications-Implementation of Device integration, Data acquisition and Integration, Device data storage on cloud/local server, Authentication, authorization of Devices.

UNIT – V

IoT Case Studies: IoT Case studies and mini projects based on industrial Automation, Transportation, Agriculture, Healthcare, Home Automation.

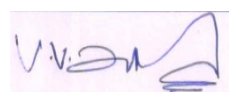
Textbooks:



1. Vijay Madiseti, ArshdeepBahga, "Internet of Things a Hands-On-Approach", 2014.

References:

1. Dr SRN Reddy, Rachit Thukral and Manasi Mishra, "Introduction to Internet of Things", A practical Approach, ETI Labs
2. Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill



WEB TECHNOLOGIES (Open Elective-III)

Course Objectives:

The course is designed to Introduce the key technologies that have been developed as part of the birth and maturation of the World Wide Web.

Course Outcomes:

- Understand the Web essentials.
- Develop web pages using XHTML.
- Apply style to web pages using CSS.
- Write scripts for client side.
- Develop and transform XML documents.

UNIT I

Web Essentials - Clients, Servers, and Communication: The Internet, Basic Internet protocols, WWW, HTTP request message, HTTP response message, Web clients, Web Servers, Case study.

UNIT II

Markup Languages - XHTML 1.0: An introduction to HTML, Basic XHTML syntax and semantics, fundamental HTML elements, Relative URLs, Lists, Tables, Frames, Forms, Defining XHTML's abstract syntax, Creating HTML documents.

UNIT III

Cascading Style Sheets: Introduction, features, core syntax, style sheets and HTML, style rule cascading and inheritance, text properties, Box model, normal flow box layout, beyond the normal flow, lists, tables, cursor styles.

UNIT IV

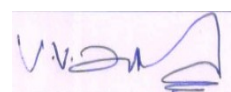
Client-side programming – JavaScript: Basic syntax, variables and data types, statements, operators, literals, functions, objects, Arrays, built-in objects, JavaScript debuggers.

UNIT V

Representing Web Data – XML: Documents and vocabularies, Versions and declaration, Namespaces, Ajax, DOM and SAX parsers, transforming XML documents, XPath, XSLT, Displaying XML documents in Web browsers.

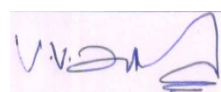
Textbooks

1. J.C. Jackson, **Web Technologies: A Computer Science Perspective**, Pearson.



Reference Books

1. Sebesta, Programming World Wide Web, Pearson.
2. Dietel and Nieto, Internet and World Wide Web – How to Program, Pearson Education.
3. Chris Bates, Web Programming: Building Internet Applications, 2nd Edition, WILEY, Dreamtech.



CYBER SECURITY (Open Elective-IV)

Course Objectives

The course is designed to provide awareness on different cyber crimes, cyber offenses, tools and methods used in cybercrime.

Course Outcomes

- Classify the cybercrimes and understand the Indian ITA 2000.
- Analyse the vulnerabilities in any computing system and find the solutions.
- Predict the security threats of the future.
- Investigate the protection mechanisms.
- Design security solutions for organizations.

UNIT I

Introduction to Cybercrime: Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, and Cybercrime: The Legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

UNIT II

Cyber Offenses - How Criminals Plan Them: Introduction, How Criminals Plan the Attacks, Social Engineering, Cyber Stalking, Cyber Cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

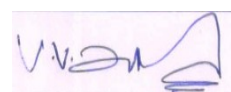
UNIT III

Cybercrime - Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT IV

Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow.

UNIT V



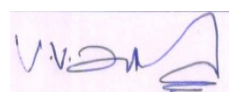
Cyber Security - Organizational Implications: Introduction, Cost of Cybercrimes and IPR Issues, Web Threats for Organizations, Security and Privacy Implications, Social Media Marketing: Security Risks and Perils for Organizations, Social Computing and the Associated Challenges for Organizations.

Textbook

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives
Nina Godbole and Sunil Belapure, Wiley India.

Reference Books

1. **Cyber Security Essentials**
James Graham, Richard Howard and Ryan Otson, CRC Press.
2. **Introduction to Cyber Security**
Chwan-Hwa (John) Wu, J. David Irwin, CRC Press, Taylor & Francis Group.



**KRISHNA UNIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGYB.
TECH(ECE) IV-VII SEM**

**MULTIMEDIA AND ITS APPLICATIONS
(Open Elective Course– III)**

Course Objectives:

- To introduce the basic concepts of multimedia systems.
- To study different types of multimedia data and their formats.
- To understand multimedia hardware and software tools.
- To explore audio, image, and video processing techniques.
- To explain the applications of multimedia in various fields.

Course Outcomes:

- Understand the basics and components of multimedia systems.
- Identify various multimedia data types and formats.
- Gain knowledge about multimedia tools and devices.
- Apply image, audio, and video compression techniques.
- Explore real-world applications of multimedia.

UNIT I

Introduction to Multimedia: Definition and types of multimedia, Components: Text, Graphics, Audio, Video, Animation, Multimediasystem architecture, Multimedia applications: Education, Entertainment, E-learning, E-commerce.

UNIT II

Multimedia Data and File Formats: Text, Image, Audio, Video data types, File formats: JPEG, GIF, PNG, TIFF, MP3, MP4, AVI, MPEG, Color models: RGB, CMYK, YUV

UNIT III

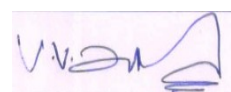
Multimedia Tools and Devices: Multimedia hardware: Input, output, storage devices, Multimedia software tools: Authoring tools, Editing tools, Operating systems for multimedia, Multimedia databases and content management

UNIT IV

Audio, Image and Video Processing: Basics of digital audio: Sampling, Editing, Compression (MP3), Basics of digital images: Formats, Editing, Compression (JPEG), Basics of video: Frame rates, Compression (MPEG, H.264), Streaming

UNIT V

Applications of Multimedia: Multimedia in Web design, Multimedia in mobile and smart devices, Virtual Reality and Augmented Reality, Multimedia in healthcare, advertising, and gaming



Textbooks:

1. Ralf Steinmetz and KlaraNahrstedt, Multimedia: Computing, Communications and Applications, Pearson Education, 2012.
2. Tay Vaughan, Multimedia: Making It Work, 8th Edition, McGraw-Hill, 2011.

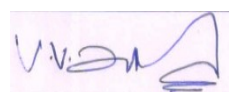
Reference Books:

Ze-Nian Li and Mark S. Drew, Fundamentals of Multimedia, 2nd Edition, Springer, 2014.

Online Learning Resources:

<https://nptel.ac.in/courses/106/105/106105174>

<https://www.tutorialspoint.com/multimedia/index.html>



**KRISHNA UNIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGYB.
TECH(ECE) IV-VII SEM**

IV YEAR-VII SEM		L	T	P	C
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SOFTWARE ENGINEERING (Open Elective Course – IV)					

Course Objectives

- To learn the basic concepts of software engineering and life cycle models.
- To explore the issues in software requirements specification and enable to write SRS documents for software development problems.
- To elucidate the basic concepts of software design and enable to carry out procedural and object oriented design of software development problems.
- To understand the basic concepts of black box and white box software testing and enable to design test cases for unit, integration, and system testing.
- To reveal the basic concepts in software project management.

Course Outcomes (CO)

After completion of the course, students will be able to:

- Obtain basic software life cycle activity skills.
- Design software requirements specifications for given problems.
- Implement structure, object oriented analysis and design for given problems.
- Design test cases for given problems.
- Apply quality management concepts at the application level.

UNIT – I

Basic Concepts in Software Engineering and Software Project Management: Basic concepts: abstraction versus decomposition, evolution of software engineering techniques, Software Development Life Cycle (SDLC) models: Iterative Waterfall Model, Prototype Model, Evolutionary Model, Spiral Model, RAD Model, Agile Models, software project management: project planning, project estimation, COCOMO, Halstead's Software Science, project scheduling, staffing, organization and team structure, risk management, configuration management.

UNIT – II

Requirements Analysis and Specification: The nature of software, The Unique Nature of Webapps, Software Myths, Requirements Gathering and Analysis, Software Requirements

Specification, Traceability, Characteristics of a Good SRS Document, IEEE 830 Guidelines, representing complex requirements using decision tables and decision trees, overview of formal system development techniques, axiomatic specification, algebraic specification. Requirements Analysis and Specification

UNIT – III

Software Design: Good Software Design, Cohesion and Coupling, Control Hierarchy: Layering, Control Abstraction, Depth and Width, Fan-out, Fan-in, Software Design Approaches, object oriented vs. function oriented design, Overview of SA/SD Methodology, Structured Analysis, Data Flow Diagram, Extending DFD Technique to Real Life Systems, Basic Object Oriented Concepts, UML Diagrams, Structured Design, Detailed Design, Design Review, Characteristics of a Good User Interface, User Guidance and Online Help, Mode-based vs Mode-less Interface, Types of User Interfaces, Component-based GUI Development, User Interface Design Methodology: GUI Design Methodology.

UNIT – IV

Coding and Testing: Coding standards and guidelines, code review, software documentation, Testing, Black Box Testing, White Box Testing, debugging, integration testing, Program Analysis Tools, system testing, performance testing, regression testing, Testing Object Oriented Programs.

UNIT – V

Software Quality, Reliability, and Other Issues: Software reliability, Statistical testing, Software quality and management, ISO 9000, SEI Capability Maturity Model (CMM), Personal Software Process (PSP), Six Sigma, Software quality metrics, CASE and its scope, CASE environment, CASE support in software life cycle, Characteristics of software maintenance, Software reverse engineering, Software maintenance process model, Estimation maintenance cost, Basic issues in any reuse program, Reuse approach, Reuse at organization level.

Textbooks

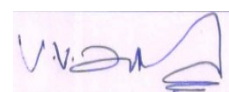
1. Rajib Mall, **Fundamentals of Software Engineering**, 5th Edition, PHI, 2018.
2. Pressman R., **Software Engineering – Practitioner Approach**, McGraw Hill.

Reference Books

1. Somerville, **Software Engineering**, Pearson.
2. Richard Fairley, **Software Engineering Concepts**, Tata McGraw Hill.
3. Jalote Pankaj, **An Integrated Approach to Software Engineering**, Narosa.

Online Learning Resources

- <https://nptel.ac.in/courses/106/105/106105182/>
- <http://peterindia.net/SoftwareDevelopment.html>

KRISHNA UNIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGYB.
TECH(ECE) IV-VII SEM

IV YEAR-VII SEM		L	T	P	C
		3	0	0	3
CLOUD COMPUTING					

Course Objective:

- To explain the evolving computer model called cloud computing.
- To introduce the various levels of services that can be achieved by cloud.
- To describe the security aspects in cloud.

Course Outcomes (CO):

After completion of the course, students will be able to

- Ability to create cloud computing environment
- Ability to design applications for Cloud environment
- Design & develop backup strategies for cloud data based on features.
- Use and Examine different cloud computing services.
- Apply different cloud programming model as per need.

UNIT I

Cloud Computing Fundamentals: Introduction to cloud computing; characteristics; cloud service and deployment models; virtualization; scalability; load balancing; cloud services; service level agreements; identity and access management.

UNIT II

Hadoop and Cloud Application: Design Hadoop architecture; MapReduce; Hadoop cluster; cloud application architecture; data storage approaches; Python fundamentals; data types; control structures; functions; file handling; object oriented programming.

UNIT III

Python for Cloud Computing: Python for cloud platforms; AWS, Google Cloud and Azure; RESTful web APIs; cloud application development; document storage; image processing; MapReduce; social media analytics.

UNIT IV

Big Data Analytics and Performance: Big data analytics; clustering; classification; recommendation systems; cloud benchmarking; workload characteristics; performance metrics; benchmarking tools; deployment and tuning.

UNIT V

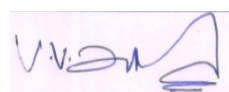
Cloud Security and Applications: Cloud security; authentication; authorization; identity and access management; data security; cloud applications in healthcare, education and industry; cloud migration; legal, privacy and security issues

Text Books

1. ArshdeepBahga and Vijay Madiseti, Cloud Computing: A Hands-on Approach, Universities Press, 2016. ISBN: 9788173719541
2. . 2. Rajkumar Buyya, James Broberg and Andrzej Goscinski, Cloud Computing: Principles and Paradigms, Wiley India, 2016. ISBN: 9788126525809.

Reference Books

1. RajkumarBuyya, Christian Vecchiola and S. Thamarai Selvi, Mastering Cloud Computing, McGraw-Hill Education, 2013. ISBN: 9781259029954.
2. Anthony T. Velte, Toby J. Velte and Robert Elsenpeter, Cloud Computing: A Practical Approach, McGraw-Hill Education, 2010. ISBN: 9780071626945.



KRISHNA UNIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGYB.
TECH(ECE) IV-VII SEM

IV YEAR-VII SEM		L	T	P	C
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INDUSTRIAL IOT & AUTOMATION					

Course Objectives:

- To provide students with good depth of knowledge of Designing Industrial IOT Systems for various application.

Learning Outcomes:

- Discover key IIoT concepts including identification, sensors, localization, wireless protocols, data storage and security.
- Explore IoT technologies, architectures, standards, and regulation.
- Realize the value created by collecting, communicating, coordinating, and leveraging the data from connected devices.
- Examine technological developments that will likely shape the industrial landscape in the future.
- Understand how to develop and implement own IoT technologies, solutions, and applications

Course Syllabus**MODULE 1: Introduction & Architecture**

What is IoT and connected world? The difference between IoT and IIoT, Architecture of IIoT, IoT node, Challenges of IIoT.

Practice:

- Introduction to Arduino <https://www.youtube.com/watch?v=AQdLQV6vhbk>

MODULE 2: IIoT Components

Fundamentals of Control System, introductions, components, closed loop & open loop system. Introduction to Sensors (Description and Working principle): What is sensor? Types of sensors, working principle of basic Sensors - Ultrasonic Sensor, IR sensor, MQ2, Temperature and Humidity Sensors (DHT-11), Digital switch, Electro Mechanical switches.

Practice:

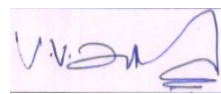
- Measurement of temperature & pressure values of the process using raspberry pi/node mcu.
- Modules and Sensors Interfacing (IR sensor, Ultrasonic sensors, Soil moisture sensor) using Raspberry pi/node mcu.
- Modules and Actuators Interfacing (Relay, Motor, Buzzer) using Raspberry pi/node mcu.

MODULE 3: Communication Technologies of IIoT

Communication Protocols: IEEE 802.15.4, ZigBee, Bluetooth, NFC, RFID Industry standards communication technology (MQTT), wireless network communication.

Practice:

- Demonstration of MQTT communication.

MODULE 4: Visualization and Data Types of IIoT

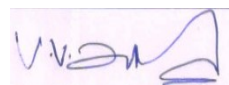
Connecting an Arduino to the Web: Introduction, setting up the Arduino development environment, Options for Internet connectivity with Arduino, Configuring your Arduino board for the IoT.

Practice:

1. Visualization of diverse sensor data using dashboard (part of IoT's 'control panel')
2. Sending alert message to the user. Ways to control and interact with your environment

MODULE 5: Retrieving Data

Extraction from Web: Grabbing the content from a web page, Sending data on the web, Troubleshooting basic Arduino issues, Types of IoT interaction, Machine to Machine interaction (M2M).



KRISHNA UNIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGY
B. TECH(ECE) IV-VII SEM

IV YEAR-VII SEM		L	T	P	C
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CONSTITUTION OF INDIA (Audit Course)					

Course Objectives:

- To understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Course Outcomes:

Upon successful completion of the course, the students will be able to

- examine the history, philosophy, and making of the Indian Constitution.
- identify and analyze Fundamental Rights, Directive Principles, and Fundamental Duties.
- examine the structure and functions of the Legislature, Executive, and Judiciary.
- explain local self-government and the importance of grass-root democracy.
- assess the role of the Election Commission and welfare institutions in India. Course Content

UNIT-I

History of Making of the Indian Constitution: History, Drafting Committee, (Composition & Working) Philosophy of the Indian Constitution- Preamble, Salient, Features

UNIT-II

Contours of Constitutional Rights & Duties: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT-III

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive- President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

UNIT-IV

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative CEO of Municipal Corporation, Panchayati raj: Introduction, PRI: ZilaPachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT-V

Election Commission: Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.

