JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year – ISemester

S. No.	Course	Category	L	T	P	Credits
1	Microwave and Optical Communication Engineering	PC	3	0	0	3
2	Data Communications & Computer networks	PC	3	0	0	3
3	Digital Image and Video Processing	PC	3	0	0	3
4	Professional Elective (PE3)	PE	3	0	0	3
5	Professional Elective (PE4)	PE	3	0	0	3
6	Internet of Things Lab	LC	0	0	3	1.5
7	Microwave and Optical Communication Engineering LAB	LC	0	0	3	1.5
8	Project - Part I	PR	0	0	6	3
			Sub-Total			**21**

IV Year – II Semester

S. No.	Course	Category	L	T	P	Credits
1	Professional Elective (PE5)	PE	3	0	0	3
2	Open Elective (OE2)	OE	3	0	0	3
3	Project - Part II	PR	0	0	18	9
			Sub-Total			**15**
			Total			**160**

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IV Year - II Semester		L	T	P	C
		3	0	0	3

WIRELESS COMMUNICATION
(Professional Elective 5)

Course Objectives:
The student will be introduced to:

- The Aim of this course is to introduce the fundamental technologies forwireless Communication andnetworking
- Introducing the concepts of Multiple AccessSchemes
- Introducing the comprehensive exposure to the fast-evolving high-tech fields of Wirelesscommunications
- It introduces the latest technologies such as CDMA, OFDM, and MIMO, whichform The bedrock of 3G/4G wirelessnetworks

UNIT I
Introduction to 3G/4G Wireless Communications: Introduction, 2G Wireless Standards, 3GWireless Standards, 4G Wireless Standards, Overview of Cellular Service ProgressionPrinciples of Wireless Communications: The Wireless Communication Environment,Modeling of Wireless Systems, System Model for Narrowband Signals, Rayleigh FadingWireless Channel, BER Performance of Wireless Systems: SNR in a Wireless System, BER inWireless Communication System, Rayleigh BER at High SNR. Intuition for BER in a FadingChannel. Channel Estimation in Wireless Systems, Diversity in Wireless Communication.

UNIT II
Code Division for Multiple Access (CDMA): Introduction to CDMA, Basic CDMAMechanism, Fundamentals of CDMA Codes, Spreading Codes based on Pseudo-Noise (PN)Sequences, Correlation Properties of Random CDMA Spreading Sequences, Multi-UserCDMA, Advantages of CDMA.

UNIT III
Multiple-Input Multiple-Output Wireless Communications: Introduction to MIMOWireless Communications, MIMO System Model, MIMO Zero-forcing (ZF) Receiver, MIMOMMSE Receiver, Singular Value Decomposition (SVD) of the MIMO Channel,Singular Value Decomposition (SVD) and MIMO Capacity

UNIT IV
Orthogonal Frequency-Division Multiplexing: Introduction, Motivation and MulticarrierBasics, OFDM Example, Bit-Error Rate (BER) for OFDM, MIMO-OFDM, Effect ofFrequency Offset in OFDM, OFDM – Peak-to-Average Power Ratio (PAPR), SC-FDMA.

UNIT V
Satellite-Based Wireless Systems: Introduction, Satellite Orbits, Use of Satellites forCommunication, Satellites and Transponders, Signal and Noise Calculations,Systems

UsingGeostationary Satellites, Systems Using Low-Earth-Orbit Satellites, Systems Using MediumEarth-Orbit Satellites.

TEXTBOOKS:

1. Principles of Modern Wireless Communication Systems – Aditya K Jagannathan,Mc Graw Hill publishers,2017
2. Wireless Communication Technology – Blake,Delmar/Cengage Learning India, first Edition,2012

REFERENCES:

1. Wireless Communications and Networking – Vijay K. Garg,MorganKaufmann,2007

Course Outcomes:

After going through this course, the student will be able to

- Know about the Wireless systems and Standards (1G/2G/3Gsystems).
- Concept and analysis of CDMA-based wirelessnetworks.
- Understand the concepts of Multiple-Input Multiple-Output(MIMO).
- Understand the modern wireless systems usingOFDM.
- Analysis of Satellite-Based Wirelesssystems.

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		3	0	0	3

VLSI TESTING & TESTABILITY
(Professional Elective 5)

Course Objectives:

- To impart knowledge on the basic faults that occur in digitalsystems
- To describe fault detection techniques in combinationalcircuits.
- To outline procedures to generate test patterns for detecting single stuck faults in combinational and sequentialcircuits.
- To explain design for testability techniques with improved faultcoverage.
- To introduce BIST concepts and specificarchitectures.
- To give exposure to approaches for introducing BIST into logic circuits, memories and embeddedcores.

UNIT I
Introduction to Test and Design for Testability (DFT) Fundamentals Modelling: Modelling digital circuits at logic level, register level and structural models, Levels of modelling. Logic Simulation: Types of simulation, Delay models, Element evaluation, Hazard detection, Gate level event driven simulation.

UNIT II
Fault Modelling – Logic fault models, Fault detection and redundancy, Fault equivalence and fault location. Single stuck and multiple stuck – Fault models. Fault simulation applications, General techniques for Combinationalcircuits.

UNIT III
Testing for single stuck faults (SSF), Automated test pattern generation (ATPG/ATG) for SSFs in combinational and sequential circuits, Functional testing with specific fault models, Vector simulation – ATPG vectors, formats, Compaction and compression, Selecting ATPGTool.

UNIT IV
Design for testability – testability trade-offs, techniques. Scan architectures and testing – controllability and Observability generic boundary scan, full integrated scan, storage cells for scan design. Board level and system level DFT approaches. Boundary scan standards. Compression techniques – different techniques, syndrome test and signature analysis

UNIT V
Built-in self-test (BIST): BIST Concepts and test pattern generation. Specific BIST Architectures – CSBL, BEST, RTS, LOCST, STUMPS, CBIST, CEBS, RTD, SST, CATS, CSTP, BILBO, Brief ideas on some advanced BIST concepts and design for self-test at board level. Memory BIST (MBIST): Memory test architectures and techniques – Introduction to memory test, Types of memories and integration, Embedded memory testing model. Memory test requirements for MBIST, Brief ideas on embedded coretesting

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TEXT BOOKS:

1. Miron Abramovici, Melvin A. Breur, Arthur D. Friedman, Digital Systems Testing and Testable Design, Jaico Publishing House,2001.
2. Alfred Crouch., Design for Test for Digital ICs & Embedded Core Systems, Prentice Hall.

REFERENCES:

1. Robert J. Feugate, Jr., Steven M. Mentyn, Introduction to VLSI Testing, Prentice Hall, Englehood Cliffs, 1998.
2. Bushnell, M., and Agrawal, Vishwani D, Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits, Kluwer AcademicPublishers,2002

Course Outcomes:

- Model digital circuits at logic and RTLlevels
- Simulate digital ICs in the presence of faults and evaluate the given test set for fault coverage
- Generate test patterns for detecting single stuck faults in combinational and sequential circuits
- Identify schemes for introducing testability into digital circuits with improved fault coverage
- Compare different approaches for introducing BIST into logic circuits, memories and embedded cores

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IV Year - II Semester		L	T	P	C
		3	0	0	3

MACHINE LEARNING & ARTIFIICIAL INTELLIGENCE
(Professional Elective 5)

OBJECTIVE:

To familiarize students with basic concepts, theories and advancements in ML and AI and help them in understanding the mathematics behind algorithms and apply them in real world scenarios

UNIT – I

Introduction to ML/AI - AI Foundation, history of AI, latest advancements and applicationsMachine Learning – I: Linear Regression - Learn to implement linear regression and predict continuous data values, Clustering - Learn how to create segments based on similarities using K-Means and Hierarchical clustering

UNIT – II

Machine Learning – II:Naïve Bayes and Logistic regression - Understand how supervised learning is used for classification, Support vector machines - Learn to classify data points using support vectors, decision trees - Tree-based model that is simple and easy to use. Learn the fundamentals on how to implement them

Natural Language Processing: Basics of text processing, lexical processing - Learn to extract features from unstructured text and build machine learning models on text data, syntax and semantics - Conduct sentiment analysis, learn to parse English sentences and extract meaning from them

UNIT – III

Deep learning & Neural Networks: Information flow in neural networks - Understand the components and structure of artificial neural networks, Training a neural network - Learn the latest techniques used to train highly complex neural networks, Convolutional neural networks - Use CNN's to solve complex image classification problems, Recurrent neural networks - Study LSTMs and RNN's applications in text analytics, Creating and deploying networks using TensorFlow and Keras (Deep Learning Library) - Build and deploy your own deep neural networks on a website, learn to use Tensor Flow API and Keras.

UNIT – IV

Graphical Models: Introduction to Bayesian methods, Graphical models - Study probabilistic way of modelling systems - Markov properties, Factor Graphs and Bayesian belief networks, Learning and Inference - Learn how graphics models are used for supervised and unsupervised learning

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UNIT – V

Reinforcement Learning: Introduction to RL, understand how machines can be programmed to learn by themselves, Exact methods - Learn the math behind Exact Statistics - Dynamic Programming, Monte Carlo methods, Temporal Difference Learning, Approximate Methods - Learn policy gradient methods and their applications in learning

TEXTBOOKS:

1. Machine Learning, by Tom M Mitchell, Indian Edition, McGraw Hill, first Edition2017.
2. Deep Learning by Goodfellow, Bengio, Courville. The MIT Press,2016
3. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill,3rd Edition 2008.

REFERENCE BOOKS

1. UnderstandingMachine Learning: From Theory to Algorithms, by Shai Shalev-Shwartzand Shai Ben-David, 1st Edition, Cambridge UniversityPress,2014.
2. Artificial Intelligence - A Modern Approach by Stuart Russell & Peter Norvig, Prentice Hall,3rdEdition,2009.

Course Outcomes:

The student should be able to:

- Understand machine learning concepts and range of problems that can be handled by machinelearning.
- Apply the machine learning concepts in real lifeproblems.
- Understand artificial neural networks concept and apply techniques to train the neural networks
- Understand how graphical models are used for supervised and unsupervisedlearning
- Understand Reinforcement Learning concept andapplications
- Modify the algorithms based onneed

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IV Year - II Semester		L	T	P	C
		3	0	0	3

SPEECH PROCESSING
(Professional Elective 5)

Course Objectives:
The main objectives of the course are as follows:
- Understand the mechanism of human speech production andarticulation
- Understand time and frequency domain methods of speechprocessing
- Understand linear predictive analysis for speech signals andLPC
- Study the algorithms and models involved for speaker and speech recognitionsystems

Unit I
Mechanics of speech
Speech production: Mechanism of speech production, Acoustic phonetics, The Acoustic Theory of Speech Production: Uniform lossless tube, Effects of losses in the vocal tract, Digital models for speech signals: Vocal tract, Radiation, Excitation, Auditory perception: psycho acoustics. Representations of speech waveform: Sampling of speech signals, Quantization.

Unit II
Time and frequency domain methods for speech processing
Time domain parameters of Speech signal: Short-Time Energy, Average Magnitude, Average Zero crossing Rate, Silence Discrimination using ZCR and energy, Short Time Auto Correlation Function, Pitch period estimation using Auto Correlation Function.
Short Time Fourier analysis: Fourier transform and linear filtering interpretations, Sampling rates in time and frequency, Pitch detection, Analysis by Synthesis, Analysis synthesis systems: Phase vocoder, Channel Vocoder, Median Smoothing, Spectrographic displays

Unit III
Linear predictive analysis of speech
Basic Principles of linear predictive analysis: Auto correlation method, Covariance method, Solutionof LPC equations: Cholesky method, Durbin's Recursive algorithm, Application of LPC parameters: Pitch detection using LPC parameters, Formant analysis using LPC parameters, VELP. Relations Between the Various Speech Parameters,CELP.

Unit IV
Application of speech processing
Voice response systems: General considerations in the design of voice response systems, A multiple output digital voice response system, Speaker recognition systems: Speaker verification system, Speaker identification system.

UNIT V
Speech recognition systems: Isolated digit recognition system, Continuous digit recognition system. Typical applications of computer voice response systems: Wiring communication equipment, Information retrieval systems

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Text books:

1. L. R. Rabiner and R. W. Schaffer, Digital Processing of Speech signals, Prentice Hall,2004
2. Ben Gold and Nelson Morgan, Speech and Audio Signal Processing, John Wiley andSons Inc., Singapore,2004

References:

1. Quatieri, Discrete-time Speech Signal Processing, Prentice Hall,2001
2. L.R. Rabiner and B. H. Juang, Fundamentals of speech recognition, Prentice Hall, 1999.

Course Outcomes:

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

- Summarize the mechanism of human speech production andarticulation
- Identify the time domain speech signalparameters
- Differentiate time and frequency domain methods of speechprocessing
- Attribute linear predictive analysis for speechsignals
- Explain the solutions for LPCequations
- Implement the different algorithms and models involved for speaker andspeech recognitionsystems

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IV Year - II Semester		L	T	P	C
		3	0	0	3

INDUSTRIAL INTERNET OF THINGS
(PROFESSIONAL ELECTIVE-5)

Course Objectives:
The main objectives of this course are:

- Learn and understand the Importance of IoT in industrialapplications
- Know how IoT has become a game changer in the new economy where the customersare looking for integratedvalue.
- Apply the IoT concepts in building solutions to Industrialproblems
- Learn and understand the tools and techniques that enable IoT solution andSecurity aspects.

UNIT-I
INTRODUCTION: Introduction to IoT, IoT Vs. IIoT, History of IIoT, Components of IIoT - Sensors, Interface, Networks, People &Process, Hype cycle, IOT Market, Trends& future Real life examples, Key terms of IoT– IoT Platform, Interfaces, API, clouds, Data Management Analytics, Mining &Manipulation; Role of IIoT in Manufacturing Processes Use of IIoT in plant maintenance practices, Sustainability through Business excellence tools Challenges and Benefits in implementing IIoT.

UNIT-II
ARCHITECTURES: Overview of IoTcomponents,Various Architectures of IoT and IIoT, Advantages & disadvantages, Industrial Internet - Reference Architecture; IIoT System components: Sensors, Gateways, Routers, Modem, Cloud brokers, servers and its integration, WSN, WSN network design for IoT.
SENSORS AND INTERFACING: Introduction to sensors, Transducers, Classification, Roles of sensors in IIoT, Various types of sensors, Design of sensors, sensor architecture, special requirements for IIoT sensors, Role of actuators, types of actuators. Hardwire the sensors with different protocols such as HART, MODBUS-Serial & Parallel, Ethernet, BACnet, Current, M2M etc.

UNIT-III
PROTOCOLS AND CLOUD: Need of protocols; Types of Protocols, Wi-Fi, Wi-Fi direct, Zigbee, Z wave, BACnet, BLE, Modbus, SPI, I2C, IIoT protocols –COAP, MQTT, 6LoWPAN, LWM2M, AMPQ IIoT cloud platforms: Overview of COTS cloud platforms, Predix, PTC Thing Worx, Microsoft Azure etc. Data analytics, cloud services, Business models: SaaS, PaaS, IaaS.

UNIT-IV
SECURITY: Introduction to web security, Conventional web technology and relationship with IIoT, Vulnerabilities of IoT, Privacy, Security requirements, Threat analysis, Trust, IoT security tomography and layered attacker model, Identity establishment, Access control, Message

integrity, Non-repudiation and availability, Security model for IoT, Network security techniques Management aspects of cyber security.
ANALYTICS: IoT Analytics: Role of Analytics in IoT, Data visualization Techniques.

UNIT-V
DIGITAL TWIN: Introduction to Digital Twin, need for Digital Twin, Elements of Digital Twin, Digital Twin process design and information requirements, Digital twin conceptual architecture - create, communicate, Aggregate, Analyze, Insight, Act, driving business value through digital twin.
DIGITAL TWIN FOR ASSET: Digitalizing asset behaviour using simulated mathematical modelling and building Digital Twin - Need, Benefits, Architecture, Models and Use cases - Predictive and Prescriptive maintenance.

TEXT BOOKS:
1. Building the Internet of Things with IPv6 and MIPv6: The EvolvingWorld of M2M Communications, by Daniel Minoli,.Bernd Scholz-Reiter, Florian,WillyPublication
2. Digital Twin Technologies and Smart Cities by Farsi, M., Daneshkhah, A.,Hosseinian-Far, A., Jahankhani, H., Springer International Publishing,2020.
3. Architecting the Internet of Things ,by Michahelles, Springer,2011

REFERENCES:
1. The Internet of Things Connecting Objects to the Web" by HakimaChaouchi,, WillyPublications
2. The Internet of Things: Key Applications and Protocols, Olivier Hersent,David Boswarthick, Omar Elloumi,, 2nd Edition, WillyPublications
3. Inside the Internet of Things (IoT), Deloitte UniversityPress
4. Internet of Things- From Research and Innovation toMarket Deployment; By Ovidiu& Peter; River PublishersSeries
5. Five thoughts from the Father of the Internet of Things; by Phil Wainewright - Kevin Ashton
6. How Protocol Conversion Addresses IIoT Challenges: White Paper By RedLion.
7. https://www.ge.com/digital/applications/digital-twin
8. https://www2.deloitte.com/us/en/insights/focus/industry-4-0/digital-twin-technology-smart-factory.html

Course Outcomes:
At the end of this course the student will be able to:
- Understand the elements of IoT to build a total control plane in an Industrialapplication
- Apply M2M protocols for development of IoT Applications.
- Learn and understand the concept of digitalization and dataacquisition.
- Build smart factory based on the IoTconcepts
- Build Industrial DigitalTwins.

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		3	0	0	3

3D PRINITING

Open Elective (OE2)

Course Objectives:

The main objectives of this course are:

- The course aims at the importance of Additive Manufacturing, classifications, models, specifications of various Additive ManufacturingTechniques.
- Principles and operation of 3Dp, Various types of3DP
- Techniques of printingelectronics
- To learn the data formats and soft-waresrequired
- The applications ofRP

UNIT-I

Introduction to Prototyping, Traditional Prototyping Vs Rapid Prototyping (RP), Need for time compression in product development, Distinction between RP and CNC and other related technologies, Classification of RP, commonly used terms, advantages and limitations of rapid prototyping.

UNIT-II

Three-Dimensional Printing (3DP)

Overview of 3DP, 3D Printer, 3D Systems, and Z Corporation, ExOne - Metal and Molding Sand Printer, Metal Line: Direct Metal Printer, Molding Sand Line: Direct Core and Mold-Making Machine, Soligen - Direct Shell Production Casting (DSPC), Voxel jet- 3D Printing System, Optomec - Maskless Mesoscale Material Deposition (M3D),

UNIT-III

Techniques for printing electronics,printing electronics,2D-printing technologies-Flexographic, Offset, Gravure, screen printing, Processes in 3D-printing electronics - Improved building process for 3D devices, Fictionalization of 3D surfaces, Current trends in 3D-printed electronics- antennas, flexible electronics, batteries, The market for 3D-printed electronics
And integrated machines

UNIT – IV

RAPID PROTOTYPING DATA FORMATS: STL Format, STL File Problems, consequence of building valid and invalid tessellated models, STL file Repairs: Generic Solution, other Translators, Newly Proposed Formats.

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RAPID PROTOTYPING SOFTWARE'S: Features of various RP software's like Magics, Mimics, Solid View, View Expert, 3 D View, Velocity 2, STL View 3 Data Expert and 3 D doctor.

UNIT –V

RP APPLICATIONS: Application in engineering, analysis and planning, aerospace industry, automotive industry, jewelry industry, coin industry, GIS application, arts and architecture. RP medical and bioengineering applications: planning and simulation of complex surgery, customized implants & prosthesis, design and production of medical devices, forensic science and anthropology, visualization of bimolecular.

TEXT BOOKS:

1. Chua Chee Kai., Leong Kah Fai., Chu Sing Lim, Rapid Prototyping: Principles and Applications in Manufacturing, World Scientific,2010.
2. Andreas Gebhardt Jan-Steffen Hotter, Additive Manufacturing: 3D Printing for prototyping and Manufacturing, Hanser Publications, 6915 Valley Avenue, Cincinnati, Ohio.
3. Ian Gibson., David W Rosen., Brent Stucker, Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, Springer,2010.

REFERENCE BOOKS:

1. Rapid Manufacturing / D.T. Pham and S.S.Dimov/Springer
2. Wohlers Report 2000 /Terry T Wohlers/WohlersAssociates
3. Rapid Prototyping & Manufacturing / Paul F.Jacobs/ASMEPress
4. Rapid Prototyping / Chua&Liou

Course Outcomes:

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

- Identify the importance of RP in presentscenario.
- Gain the knowledge on3DP
- Application of 3DP in electronics.
- Minimize various errors that are occurring during conversion of CADmodels.
- Applications ofRP.

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		3	0	0	3

BLOCKCHAIN TECHNLOGY
Open Elective (OE2)

Course Objectives:
The main objectives of this course are:

- Understand how block chain systems (mainly Bit coin and Ethereum) work and to securely interact withthem,
- Design, build, and deploy smart contracts and distributedapplications,
- Integrate ideas from block chain technology into their ownprojects.

Unit I:
Introduction: Scenarios, Challenges Articulated, Blockchain, Blockchain Characteristics, Opportunities Using Blockchain, History of Blockchain.
Evolution of Blockchain: Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Blockchain Evolution, Consortia, Forks, Public Blockchain Environments, Type of Players in Blockchain Ecosystem, Players inMarket.

Unit II:
Blockchain Concepts: Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on blockchain, data storage on blockchain, wallets, coding on blockchain: smart contracts, peer-to-peer network, types of blockchain nodes, risk associated with blockchain solutions, life cycle of blockchain transaction.

Unit III:
Architecting Blockchain solutions: Introduction, Obstacles for Use of Blockchain, Blockchain Relevance Evaluation Framework, Blockchain Solutions Reference Architecture, Types of Blockchain Applications, Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Blockchain Solutions, Architecture Considerations, Architecture with Blockchain Platforms, Approach for Designing Blockchain Applications.

Unit IV:
Ethereum Blockchain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, MyEtherWallet, Ethereum Networks/Environments, Infura, Etherscan, Ethereum Clients, Decentralized Application, Metamask, Tuna Fish Use Case Implementation, OpenZeppelinContracts

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Unit V:
Hyperledger Blockchain Implementation: Introduction, Use Case – Car Ownership Tracking, Hyperledger Fabric, Hyperledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chaincode Functions Using Client Application.
Advanced Concepts in Blockchain: Introduction, InterPlanetary File System (IPFS), Zero-Knowledge Proofs, Oracles, Self-Sovereign Identity, Blockchain with IoT and AI/ML Quantum Computing and Blockchain, Initial Coin Offering, Blockchain Cloud Offerings, Blockchain and its Future Potential.

TEXT BOOKS:
1) "Blockchain for Enterprise Application Developers", Ambadas, Arshad SarfarzAriff, Sham - Wiley
2) "Mastering Bitcoin: Programming the Open Blockchain", Andreas M. Antonpoulos,O'Reilly

REFERENCES:
1) Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph Bambara, Paul R. Allen, Mc GrawHill.
2) Blockchain: Blueprint for a New Economy, Melanie Swan,O'Reilly

E-RESOURCES:
https://github.com/blockchainedindia/resources

Course Outcomes:
At the end of this course the student will be able to:

- Demonstrate the foundation of the Block chain technology and understand the processes in payment andfunding.
- Identify the risks involved in building Block chainapplications.
- Review of legal implications using smartcontracts.
- Choose the present landscape of Blockchain implementations and Understand Crypto currencymarkets
- Examine how to profit from trading cryptocurrencies.

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		3	0	0	3

CYBER SECURITY & CRYPTOGRAPHY

Open Elective (OE2)

Course Objectives:

- Able to identify security risks and take preventive steps
- To understand the forensicsfundamentals.
- To understand the evidence capturingprocess.
- To understand the preservation of digitalevidence.

Unit I : Introduction to Cybercrime: Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Cybercriminals, Classifications of Cybercrime, Cyberstalking, Cybercafe and Cybercrimes, Botnets. Attack Vector,· Proliferation of Mobile and Wireless Devices, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones, Network and Computer Attacks,

Unit II: Tools and Methods : Proxy Servers and Anonymizers, Phishing, Password Cracking,· Keyloggers and Spywares,Virus and Worms,· Trojan Horses and Backdoors,· Steganography, Sniffers, Spoofing, Session Hijacking Buffer over flow, DoS and DDoS Attacks, SQL Injection, Buffer Overflow,· Attacks on Wireless Networks, Identity Theft (ID Theft), Foot Printing and Social Engineering, Port Scanning, Enumeration

Unit III : Cyber Crime Investigation: Introduction, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure ofComputers, Recovering Deleted Evidences, Password Cracking.

Unit IV: Computer Forensics and Investigations: Understanding Computer Forensics, Preparing for Computer Investigations. Current Computer Forensics Tools**:** Evaluating Computer Forensics Tools, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Validating and Testing Forensics Software, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Graphics and Network Forensics, E-mail Investigations, Cell Phone and Mobile Device Forensics

Unit V: Cyber Crime Legal Perspectives: Introduction,· Cybercrime and the Legal Landscape around the World,The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India,· Consequences of Not Addressing the Weakness in Information Technology Act,· Digital Signatures and the Indian IT Act,· Amendments to the Indian IT Act,· Cybercrime and Punishment,· Cyberlaw, Technology and Students: Indian Scenario**.**

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TEXT BOOKS:

1. Sunit Belapure Nina Godbole "Cyber Security: Understanding Cyber Crimes,Computer Forensics and Legal Perspectives", WILEY,2011.
2. NelsonPhillipsandEnfingerSteuart,"ComputerForensicsandInvestigations",Cengage Learning, New Delhi,2009.

REFERENCE BOOKS:

1. Michael T. Simpson, Kent Backman and James E. Corley, "Hands on EthicalHacking and Network Defence", Cengage,2019.
2. Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.
3. Alfred Basta, Nadine Basta,Mary Brown and Ravinder Kumar "Cyber Security and Cyber Laws" ,Cengage,2018.

Web References:

1. CERT-In Guidelines- http://www.cert-in.org.in/
2. https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks[OnlineCourse]
3. https://computersecurity.stanford.edu/free-online-videos[Free OnlineVideos]
4. Nickolai Zeldovich. 6.858 Computer Systems Security. Fall 2014. Massachusetts Institute of Technology: MIT OpenCourseWare, https://ocw.mit.edu. License:Creative Commons BY-NC-SA.

Course Outcomes:

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

- Explain the computer forensicsfundamentals.
- Describe the types of computer forensicstechnology
- Analyze various computer forensicssystems.
- Illustrate the methods for data recovery, evidence collection and dataseizure.

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

OPEN ELECTIVES OFFERED BY ECE

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PRINCIPLES OF COMMUNICATION

Open Elective (OE1)

Course objectives:
This course will enable students to:

- Understand simple systems for generating and demodulating AM, DSB, SSB andVSB signals
- Understand the concepts in Angle modulation for the design of communicationsystems
- Study simple systems for generating and demodulating frequency modulatedsignals
- Learn the concepts of random process and various types ofnoise.
- Study the performance of the communication system in presence ofnoise.
- Learn pulse modulation and samplingtechniques

UNIT-1
Amplitude modulation: Introduction, Amplitude Modulation: Time & Frequency – Domain description, switching modulator, Envelop detector.
Double side band-suppressed carrier modulation: Time and Frequency – Domain description, Ring modulator, Coherent detection, Costas Receiver, Quadrature Carrier Multiplexing.
Single side–band and vestigial sideband methods ofmodulation: SSB Modulation, VSB Modulation, FrequencyTranslation, Frequency- Division Multiplexing,Theme Example: VSB Transmission of Analog and Digital Television

UNIT-II
Angle modulation: Basic definitions, Frequency Modulation: Narrow Band FM, Wide Band FM, Transmission bandwidth of FM Signals, Generation of FM Signals, Demodulation of FM Signals, FM StereoMultiplexing,
Phase–Locked Loop: Nonlinear model of PLL, Linear model of PLL, Nonlinear Effects in FM Systems. The Super heterodyne Receiver

UNIT-III
Random variables & process: Introduction, Probability, Conditional Probability, Random variables, Several Random Variables. Statistical Averages: Function of a random variable, Moments, Random Processes, Mean, Correlation and Covariance function: Properties of autocorrelation function, Cross–correlation functions.
Noise: Shot Noise, Thermal noise, White Noise, Noise EquivalentBandwidth, Noise Figure.

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UNIT-IV

Noise in analog modulation: Introduction, Receiver Model, Noise in DSB-SC receivers, Noise in AM receivers, Threshold effect, Noise in FM receivers, Capture effect, FM threshold effect, FM threshold reduction, Pre-emphasis and De-emphasise inFM.

UNIT-V

Digital representation of analog signals: Introduction,Why Digitize Analog Sources?, The Sampling process, Pulse Amplitude Modulation, Time Division Multiplexing, Pulse-Position Modulation, Generation of PPM Waves, Detection of PPM Waves, The Quantization Process, Quantization Noise,

Pulse Code Modulation: Sampling, Quantization, Encoding, Regeneration, Decoding, Filtering, Multiplexing

Text books:

1. Principles of Communication Systems – H Taub & D. Schilling, GautamSahe, TMH, 2007, 3rdEdition.
2. Communication Systems – B.P. Lathi, BS Publication,2006.

References:

1. Principles of Communication Systems - Simon Haykin, John Wiley,2ndEdition.
2. Electronics & Communication System – George Kennedy and Bernard Davis,TMH 2004.
3. Communication Systems– R.P. Singh, SP Sapre, Second Edition TMH,2007.

Course Outcomes:

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

- Analyze the performance of analog modulation schemes in time and frequencydomains.
- Analyze the performance of angle modulatedsignals.
- Characterize analog signals in time domain as random processes andnoise
- Characterize the influence of channel on analog modulatedsignals
- Determine the performance of analog communication systems in terms ofSNR
- Analyze pulse amplitude modulation, pulse position modulation, pulse code modulation and TDM systems.

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EMBEDDED SYSTEMS

Open Elective (OE2)

Course Objectives:
The main objectives of this course are given below**:**

- The basic concepts of an embedded system areintroduced.
- The various elements of embedded hardware and their design principles areexplained.
- Different steps involved in the design and development of firmware for embedded systems iselaborated.
- Internals of Real-Time operating system and the fundamentals of RTOS based embedded firmware design isdiscussed.
- Fundamental issues in hardware software co-design were presented andexplained.
- Familiarize with the different IDEs for firmware development for different family of processors/controllers and embedded operatingsystems.
- Embedded system implementation and testing tools are introduced anddiscussed.

UNIT-I
INTRODUCTION: Embedded system-Definition, history of embedded systems, classification of embedded systems, major application areas of embedded systems, purpose of embedded systems, the typical embedded system-core of the embedded system, Memory, Sensors and Actuators, Communication Interface, Embedded firmware, Characteristics of an embedded system, Quality attributes of embedded systems, Application-specific and Domain-Specific examples of an embedded system.

UNIT-II
EMBEDDED HARDWARE DESIGN: Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock.

UNIT-III
EMBEDDED FIRMWARE DESIGN: Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versusCross-compiler.

UNIT-IV
REAL TIME OPERATING SYSTEM: Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Threads, Processes and Scheduling, Task communication, Task synchronisation.
HARDWARE SOFTWARE CO-DESIGN: Fundamental Issues in Hardware Software Co-Design, Computational models in embedded design, Hardware software Trade-offs, Integration of Hardware andFirmware.

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UNIT-V:

EMBEDDED SYSTEM DEVELOPMENT, IMPLEMENTATION AND TESTING: The integrated development environment, Types of files generated on cross-compilation, Deassembler/Decompiler, Simulators, Emulators and Debugging, Target hardware debugging, Embedded Software development process and tools, Interpreters, Compilers and Linkers, Debugging tools, Quality assurance and testing of the design, Testing on host machine, Simulators, Laboratory Tools.

Text Books:

1. Embedded Systems Architecture- By Tammy Noergaard, Elsevier Publications,2013.
2. Embedded Systems-By Shibu. K.V-Tata McGraw Hill Education Private Limited,2013.

References:

1. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications,2013.
2. Embedded Systems-Lyla B.Das-Pearson Publications,2013.

Course Outcomes:

At the end of this course the student can able to:

- Understand the basic concepts of an embedded system and able to know an embedded system design approach to perform a specificfunction.
- The hardware components required for an embedded system and the design approach of an embeddedhardware.
- The various embedded firmware design approaches on embeddedenvironment.
- Understand how to integrate hardware and firmware of an embedded system using real time operatingsystem.