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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

COURSE STRUCTURE & SYLLABUS M.Tech ECE

COMMUNICATION SYSTEMS (CS)

Programme

(Applicable for batches admitted from 2019-2020)



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA



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I Semester

S. No.	Course Type/Code	Course Name	Teaching Scheme			Credits
			L	T	P	
1	Core 1	Digital Data Communications	3	0	0	3
2	Core 2	Advanced Digital Signal Processing	3	0	0	3
3	Prog. Specific Elective	Elective I I. Radar Signal Processing II. RF Circuit Design III. Advanced Computer Networks	3	0	0	3
4	Prog. Specific Elective	Elective II I. Wireless LANs and PANs II. Mobile Computing Technologies III. Network Security & Cryptography	3	0	0	3
5	Lab 1	Data Communications Laboratory	0	0	4	2
6	Lab2	Advanced Digital Signal Processing Lab	0	0	4	2
7		Research Methodology and IPR	2	0	0	2
8	Aud 1	Audit Course 1	2	0	0	0
Total Credits			16	0	8	18

II Semester

S. No.	Course Type/Code	Name of the Subject	Teaching Scheme			Credits
			L	T	P	
1	Core 3	Wireless Communications and Networks	3	0	0	3
2	Core 4	Image and Video Processing	3	0	0	3
3	Prog. Specific Elective	Elective III I. Soft Computing Techniques II. Internet Protocols III. Cyber Security	3	0	0	3
4	Prog. Specific Elective	Elective IV I. Optical Networks II. DSP Processors and Architectures III. Radio and Navigational Aids	3	0	0	3
5	Lab 1	Advanced Communications Lab	0	0	4	2
6	Lab2	Advanced Digital Image and video processing Laboratory	0	0	4	2
7		Mini Project(Seminar)	0	0	4	2
8	Aud 2	Audit Course 2	2	0	0	0
			14	0	12	18



III Semester

S. No.	Course Type/Code	Subject	Teaching Scheme			Credits
1	Prog. Specific Elective	a. Detection & Estimation Theory b. Coding Theory and Applications c. Software Defined Radio	3	0	0	3
2	Open Elective	1. Business Analytics 2. Industrial Safety 3. Operations Research 4. Cost Management of Engineering Projects 5. Composite Materials 6. Waste to Energy	3	0	0	3
3	Dissertation	Dissertation Phase – I	0	0	20	10
Total Credits			6	0	20	16

IV Semester

S. No.	Course Code	Subject	Teaching Scheme			Credits
			L	T	P	
1	Dissertation	Dissertation Phase – II	--	--	32	16
Total Credits			--	--	32	16

Audit course 1 & 2

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technical Knowledge
4. Value Education
5. Constitution of India
6. Pedagogy Studies
7. Stress Management by Yoga
8. Personality Development through Life Enlightenment Skills.

**I Year I Semester**

L	T	P	C
3	0	0	3

DIGITAL DATA COMMUNICATIONS**Course objectives**

The main objectives of this subject are:

1. Different modulation techniques to improve the bandwidth and their properties.
2. Networking and different protocol systems.
3. Error estimation and correction, asynchronous and synchronous protocols.
4. Multiplexing techniques, different networking connections and interfacing devices.
5. Multiple access techniques and analysis.

UNIT -I:**Digital Modulation Schemes:**

BPSK, QPSK, 8PSK, 16PSK, 8QAM, 16QAM, DPSK – Methods, Band Width Efficiency, Carrier Recovery, Clock Recovery.

UNIT -II:**Basic Concepts of Data Communications, Interfaces and Modems:**

Data Communication Networks, Protocols and Standards, UART, USB, Line Configuration, Topology, Transmission Modes, Digital Data Transmission, DTE-DCE interface, Categories of Networks – TCP/IP Protocol suite and Comparison with OSI model.

UNIT -III:

Error Correction: Types of Errors, Vertical Redundancy Check (VRC), LRC, CRC, Checksum, Error Correction using Hamming code

Data Link Control: Line Discipline, Flow Control, Error Control

Data Link Protocols: Asynchronous Protocols, Synchronous Protocols, Character Oriented Protocols, Bit-Oriented Protocol, Link Access Procedures.

UNIT -IV:

Multiplexing: Frequency Division Multiplexing (FDM), Time Division Multiplexing (TDM), Multiplexing Application, DSL.

Local Area Networks: Ethernet, Other Ether Networks, Token Bus, Token Ring, FDDI.

Metropolitan Area Networks: IEEE 802.6, SMDS

Switching: Circuit Switching, Packet Switching, Message Switching.

Networking and Interfacing Devices: Repeaters, Bridges, Routers, Gateway, Other Devices.

UNIT -V:**Multiple Access Techniques:**

Frequency- Division Multiple Access (FDMA), Time - Division Multiple Access (TDMA), Code - Division Multiple Access (CDMA), OFDM and OFDMA. Random Access, Aloha- Carrier Sense Multiple Access (CSMA) - Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA), Controlled Access- Reservation- Polling- Token Passing, Channelization.



TEXT BOOKS:

1. Data Communication and Computer Networking - B. A. Forouzan, 2nd Ed., 2003, TMH.
2. Advanced Electronic Communication Systems - W. Tomasi, 5th Ed., 2008, PEI.

REFERENCE BOOKS:

1. Data Communications and Computer Networks - Prakash C. Gupta, 2006, PHI.
2. Data and Computer Communications - William Stallings, 8th Ed., 2007, PHI.
3. Data Communication and Tele Processing Systems - T. Housely, 2nd Ed, 2008, BSP.
4. Data Communications and Computer Networks- Brijendra Singh, 2nd Ed., 2005, PHI.

Course outcomes:

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

1. Model digital communication system using appropriate mathematical techniques (error probability, constellation diagrams, phasor diagrams).
2. Understanding the basic concepts of how digital data is transferred across computer networks.
3. Independently understand basic computer network technology.
4. Understand and explain Data Communications System and its components.
5. Identify the different types of network topologies and protocols.
6. Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
7. Identify the different types of network devices and their functions within a network
8. Understand and building the skills of sub netting and routing mechanisms.
9. Familiarity with the basic protocols of computer networks, and how they can be used
10. To assist in network design and implementation.


I Year I Semester

L	T	P	C
3	0	0	3

ADVANCED DIGITAL SIGNAL PROCESSING
COURSE OBJECTIVES:

The main objectives of this course are given below:

- To introduce design and implementation techniques of digital filter (both FIR & IIR).
- To introduce the concept of sampling rate conversion, different forms of filter implementation for sampling rate conversion and multi stage implementation of sampling rate conversion.
- To introduce the applications of sampling rate conversion techniques.
- To introduce the concepts of linear prediction and solution of normal equations.
- To introduce the Adaptive filter concepts and non-parametric methods of power spectrum estimation.
- To introduce the wavelets and applications of DSP.

UNIT –I:
Review of DFT, FFT, IIR Filters and FIR Filters:

Multi Rate Signal Processing: Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Multistage Implementation of Sampling Rate Conversion, Filter design & Implementation for sampling rate conversion.

UNIT –II:
Applications of Multi Rate Signal Processing:

Design of Phase Shifters, Interfacing of Digital Systems with Different Sampling Rates, Implementation of Narrow Band Low Pass Filters, Implementation of Digital Filter Banks, Sub-band Coding of Speech Signals, Quadrature Mirror Filters, Trans-multiplexers, Over Sampling A/D and D/A Conversion.

UNIT -III:

Non-Parametric Methods of Power Spectral Estimation: Estimation of spectra from finite duration observation of signals, Non-parametric Methods: Bartlett, Welch & Blackman-Tukey methods, Comparison of all Non-Parametric methods

UNIT –IV:
Implementation of Digital Filters:

Introduction to filter structures (IIR & FIR), Frequency sampling structures of FIR, Lattice structures, Forward prediction error, Backward prediction error, Reflection coefficients for lattice realization, Implementation of lattice structures for IIR filters, Advantages of lattice structures.



UNIT –V:

Parametric Methods of Power Spectrum Estimation: Autocorrelation & Its Properties, Relation between auto correlation & model parameters, AR Models - Yule-Walker & Burg Methods, MA & ARMA models for power spectrum estimation, Finite word length effect in IIR digital Filters – Finite word-length effects in FFT algorithms.

TEXT BOOKS:

1. Digital Signal Processing: Principles, Algorithms & Applications - J.G. Proakis & D. G. Manolakis, 4th Ed., PHI.
2. Discrete Time Signal Processing - Alan V Oppenheim & R. W Schaffer, PHI.
3. DSP – A Practical Approach – Emmanuel C. Ifeachor, Barrie. W. Jervis, 2 Ed., Pearson Education.

REFERENCE BOOKS:

1. Modern Spectral Estimation: Theory & Application – S. M .Kay, 1988, PHI.
2. Multi Rate Systems and Filter Banks – P.P.Vaidyanathan – Pearson Education.
3. Digital Signal Processing – S.Salivahanan, A.Vallavaraj, C.Gnanapriya, 2000,TMH
4. Digital Spectral Analysis – Jr. Marple

COURSE OUTCOMES :

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

1. design and implement the digital filters (both FIR & IIR).
2. describe sampling rate conversion and multi-rate signal processing, in the digital domain.
3. apply the concepts of sampling rate conversion in the implementation of digital filter banks, quadrature mirror filters and their use in subband coding.
4. To understand theory of forward-backward linear prediction filters and solution of normal equations.
5. understand Adaptive filtering and the concepts of non-parametric methods of power spectrum estimation.
6. To know the applications based on DSP and multi-rate DSP.



I Year I Semester

L	T	P	C
3	0	0	3

RADAR SIGNAL PROCESSING (ELECTIVE -I)

Course Objectives:

The main objectives of this subject are:

1. Derivation of Radar range and Design of matched filter for different noises.
2. Signal detection techniques at receiver.
3. Optimum Radar Waveforms for Detection of signals in Clutter and various Families.
4. The characteristics of a Linear pulse and digital compression to Radar signals.
5. The principles of different phase coding techniques and analysis.

UNIT -I:

Introduction:

Radar Block Diagram, Bistatic Radar, Monostatic Radar, Radar Equation, Information Available from Radar Echo. Review of Radar Range Performance– General Radar Range Equation, Radar Detection with Noise Jamming, Beacon and Repeater Equations, MTI and Pulse Doppler Radar. Matched Filter Receiver – Impulse Response, Frequency Response Characteristic and its Derivation, Matched Filter and Correlation Function, Correlation Detection and Cross-Correlation Receiver, Efficiency of Non-Matched Filters, Matched Filter for Non-White Noise.

UNIT -II:

Detection of Radar Signals in Noise:

Detection Criteria – Neyman-Pearson Observer, Likelihood-Ratio Receiver, Inverse Probability Receiver, Sequential Observer, Detectors–Envelope Detector, Logarithmic Detector, I/Q Detector. Automatic Detection-CFAR Receiver, Cell Averaging CFAR Receiver, CFAR Loss, CFAR Uses in Radar. Radar Signal Management–Schematics, Component Parts, Resources and Constraints.

UNIT -III:

Waveform Selection [3, 2]:

Radar Ambiguity Function and Ambiguity Diagram – Principles and Properties; Specific Cases – Ideal Case, Single Pulse of Sine Wave, Periodic Pulse Train, Single Linear FM Pulse, Noise Like Waveforms, Waveform Design Requirements, Optimum Waveforms for Detection in Clutter, Family of Radar Waveforms.

UNIT -IV:

Pulse Compression in Radar Signals:

Introduction, Significance, Types, Linear FM Pulse Compression – Block Diagram, Characteristics, Reduction of Time Side lobes, Stretch Techniques, Generation and Decoding of FM Waveforms – Block Schematic and Characteristics of Passive System, Digital Compression, SAW Pulse Compression.



UNIT V:

Phase Coding Techniques:

Principles, Binary Phase Coding, Barker Codes, Maximal Length Sequences (MLS/LRS/PN), Block Diagram of a Phase Coded CW Radar.

Poly Phase Codes : Frank Codes, Costas Codes, Non-Linear FM Pulse Compression, Doppler Tolerant PC Waveforms – Short Pulse, Linear Period Modulation (LPM/HFM), Sidelobe Reduction for Phase Coded PC Signals.

TEXT BOOKS:

1. Radar Handbook - M.I. Skolnik, 2nd Ed., 1991, McGraw Hill.
2. Radar Design Principles : Signal Processing and The Environment - Fred E. Nathanson, 2nd Ed., 1999, PHI.
3. Introduction to Radar Systems - M.I. Skolnik, 3rd Ed., 2001, TMH.

REFERENCE BOOKS:

1. Radar Principles - Peyton Z. Peebles, Jr., 2004, John Wiley.
2. Radar Signal Processing and Adaptive Systems - R. Nitzberg, 1999, Artech House.

Course Outcomes:

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

1. Understand the operation of Radar and characteristics of Matched filter for non-white noise.
2. Understand the various detection criterion and types of detectors that can be used to detect the Radar signals in noise.
3. Understand the waveform design requirements and optimum waveforms for the detection of signals in clutter.
4. Know the significance and types of pulse compression techniques for analog and digital signals.
5. Understand the requirements of phase coding in Radar and various poly phase codes used for phase coding.



I Year I Semester

L	T	P	C
3	0	0	3

**RF CIRCUIT DESIGN
(ELECTIVE - I)**

UNIT -I:

Introduction to RF Electronics:

The Electromagnetic Spectrum, units and Physical Constants, Microwave bands – RF behavior of Passive components: Tuned resonant circuits, Vectors, Inductors and Capacitors - Voltage and Current in capacitor circuits – Tuned RF / IF Transformers.

UNIT -II:

Transmission Line Analysis: Examples of transmission lines- Transmission line equations and Biasing- Micro Strip Transmission Lines- Special Termination Conditions- sourced and Loaded Transmission Lines. **Single And Multiport Networks:** The Smith Chart, Interconnectivity networks, Network properties and Applications, Scattering Parameters.

UNIT -III:

Matching and Biasing Networks:

Impedance matching using discrete components – Micro strip line matching networks, Amplifier classes of Operation and Biasing networks. **RF Passive & Active Components:** Filter Basics – Lumped filter design – Distributed Filter Design – Diplexer Filters- Crystal and Saw filters- Active Filters - Tunable filters – Power Combiners / Dividers – Directional Couplers – Hybrid Couplers – Isolators. RF Diodes – BJTs- FETs- HEMTs and Models.

UNIT -IV:

RF Transistor Amplifier Design: Characteristics of Amplifiers - Amplifier Circuit Configurations, Amplifier Matching Basics, Distortion and noise products, Stability Considerations, Small Signal amplifier design, Power amplifier design, MMIC amplifiers, Broadband High Power multistage amplifiers, Low noise amplifiers, VGA Amplifiers.

UNIT -V:

Oscillators: Oscillator basics, Low phase noise oscillator design, High frequency Oscillator configuration, LC Oscillators, VCOs, Crystal Oscillators, PLL Synthesizer, and Direct Digital Synthesizer. **RF Mixers:** Basic characteristics of a mixer - Active mixers- Image Reject and Harmonic mixers, Frequency domain considerations.



TEXT BOOKS:

1. RF Circuit design: Theory and applications by Reinhold Ludwig, PavelBretchko. Pearson Education Asia Publication, New Delhi 2001.
2. Radio Frequency and Microwave Communication Circuits – Analysis and Design – Devendra K. Misra, Wiley Student Edition, John Wiley & Sons

REFERENCE BOOKS:

1. Radio frequency and Microwave Electronics - Mathew M.Radmangh, 2001, PE Asia Publ.
2. RF Circuit Design – Christopher Bowick, Cheryl Aljuni and John Biyler, Elsevier Science, 2008.
3. Secrets of RF Design - Joseph Carr., 3rd Edition, Tab Electronics.
4. Complete Wireless Design - Cotter W. Sawyer, 2nd Edition, Mc-Graw Hill.
5. Practical RF Circuit Design for Modern Wireless Systems Vol.2 -Less Besser and Rowan Gilmore.

Course Outcomes:

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

1. Understand the behaviour of RF passive components and model active components.
2. Perform transmission linear analysis.
3. Demonstrate use of Smith Chart for high frequency circuit design.
4. Justify the choice/selection of components from the design aspects.
5. Contribute in the areas of RF circuit design.

**I Year I Semester**

L	T	P	C
3	0	0	3

ADVANCED COMPUTER NETWORKS
(ELECTIVE - I)

Course objectives:

1. The aim of this course is to introduce key concepts and principles of computer networks and Congestion and Quality of Service .
2. Illustrate reference models with layers, protocols and interfaces.
3. Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.
4. Have the knowledge on Interconnection Networks, Look into the widely used networks like SONET/SDH. and describe how routing protocols work.
5. To know the basic concepts of Spread Spectrum, Discuss Ipv6 addresses. Compare Ipv4 and Ipv6 addresses and look into the transition from Ipv4 to Ipv6.
6. To have knowledge on IEEE802.11, and to know the basic cellular concepts and describe the features and functions of multiplexing and modulation.

UNIT -I:**Congestion and Quality of Service (QoS):**

Data traffic, Congestion, Congestion Control, Two examples, Quality of Service, Techniques to improve QOS, Integrated Services and Differential services. **Queue Management:** Passive-Drop, Drop front, Random drop, Active- early Random drop, Random Early detection.

UNIT -II:

X.25 Standards: X.25 Layers, X.21 Protocol, **Frame Relay:** Introduction, Frame relay operation, Frame relay layers, Congestion control, Leaky Bucket algorithms, **ATM:** Design goals, ATM architecture, Switching, Switch Fabric, ATM layers, Service classes, ATM applications

UNIT -III:

Interconnection Networks: Introduction, Banyan Networks, Properties, Crossbar switch, Three stage Class networks, Rearrangeable Networks, Folding algorithm, Benes Networks, Lopping algorithm, Bit allocation algorithm. **SONET/SDH:** Synchronous Transport signals, Physical configuration, SONET layers, SONET Frame.

UNIT -IV:

Spread Spectrum: Introduction, Basic concept, Protection against Jamming, Spreading codes (PN sequence), Generation, Properties, Types of Spread Spectrum Modulation, Application of Spread Spectrum. **Private Networks:** Virtual Private Networks, Network Address Translation

Next Generation: IPV6 Transition from IPV4 to IPV6, **Mobile IP:** Addressing, Agents, Three phases, Inefficiency in Mobile IP



UNIT -V:

Wireless Networks: **Wireless LAN:** IEEE802.11, Architecture, MAC Sub Layer, Addressing Mechanism, Physical Layer. **Bluetooth:** Architecture, Bluetooth layers, Radio layer, Base band layer, L2CAP, **Wireless WAN:** The Cellular Concept, Cell, Frequency reuse, Principle, Channel Assignment Strategies, Interference and system capacity, Types of interference, Improving capacity in cellular system, Handoff, AMPS, D-AMPS, GSM, CDMA, GPRS, 3G & 4G technologies.

TEXT BOOKS:

1. Data Communication and Networking - B. A. Forouzan, 4th Ed, TMH
2. TCP/IP Protocol Suit – B. A. Forouzen, 4th Ed, TMH

REFERENCE BOOKS:

1. Wireless Communication System- Abhishek Yadav, University Sciences Press
2. Wireless Digital Communications – Kamilo Feher, 1999, PHI
3. High Performance TCP-IP Networking- Mahaboob Hassan, Jain Raj, PHI
4. ATM Fundamentals- N. N. Biswas, Adventure Book Publishers, 1998
5. Wireless Communication – T. L. Singhal, McGraw Hill, 2010
6. Wireless Communication and Networking- Vijay K. Garg, Elsevier, 2009

Course Outcomes

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

1. Able to Define Congestion and Quality of Service and Illustrate reference models with layers, protocols and interfaces.
2. Familiar with the basic protocols of computer networks, and how they can be used to assist in network design and implementation
3. Understand the general principles behind , addressing, routing, reliable transmission and other state full protocols
4. Have an informed view of both the internal workings of the Internet and of a number of common Internet applications and protocols
5. Familiar with the basic cellular concepts and understand the importance of multiple accessing schemes.

**I Year I Semester**

L	T	P	C
3	0	0	3

WIRELESS LANs AND PANs
(ELECTIVE – II)

UNIT –I:**Wireless System & Random Access Protocols:**

Introduction, First and Second Generation Cellular Systems, Cellular Communications from 1G to 3G, Wireless 4G systems, The Wireless Spectrum; Random Access Methods: Pure ALOHA, Slotted ALOHA, Carrier Sense Multiple Access (CSMA), Carrier Sense Multiple Access with Collision Detection (CSMA/CD), Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA).

UNIT –II:**Wireless LANs:**

Introduction, importance of Wireless LANs, WLAN Topologies, Transmission Techniques: Wired Networks, Wireless Networks, comparison of wired and Wireless LANs; WLAN Technologies: Infrared technology, UHF narrowband technology, Spread Spectrum technology

UNIT –III:**The IEEE 802.11 Standard for Wireless LANs:**

Network Architecture, Physical layer, The Medium Access Control Layer; MAC Layer issues: Hidden Terminal Problem, Reliability, Collision avoidance, Congestion avoidance, Congestion control, Security, The IEEE 802.11e MAC protocol

UNIT –IV:**Wireless PANs:**

Introduction, importance of Wireless PANs, The Bluetooth technology: history and applications, technical overview, the Bluetooth specifications, piconet synchronization and Bluetooth clocks, Master-Slave Switch; Bluetooth security; Enhancements to Bluetooth: Bluetooth interference issues, Intra and Inter Piconet scheduling, Bridge selection, Traffic Engineering, QoS and Dynamics Slot Assignment, Scatternet formation.

UNIT –V:**The IEEE 802.15 working Group for WPANs:**

The IEEE 802.15.3, The IEEE 802.15.4, ZigBee Technology, ZigBee components and network topologies, The IEEE 802.15.4 LR-WPAN Device architecture: Physical Layer, Data Link Layer, The Network Layer, Applications; IEEE 802.15.3a Ultra wideband.

TEXT BOOKS:

1. Ad Hoc and Sensor Networks - Carlos de MoraisCordeiro and Dharma PrakashAgrawal, World Scientific, 2011.
2. Wireless Communications and Networking - Vijay K.Garg, Morgan Kaufmann Publishers, 2009.

REFERENCE BOOKS

1. Wireless Networks - KavehPahlaram, Prashant Krishnamurthy, PHI, 2002.
2. Wireless Communication- Marko Gjonovic, Pearson Education, Cengage Learning, 2007.



**I Year I Semester**

L	T	P	C
3	0	0	3

MOBILE COMPUTING TECHNOLOGIES
(ELECTIVE – II)

UNIT –I:**Introduction to Mobile Computing Architecture:**

Mobile Computing – Dialog Control – Networks – Middleware and Gateways – Application and Services – Developing Mobile Computing Applications – Security in Mobile Computing – Architecture for Mobile Computing – Three Tier Architecture – Design considerations for Mobile Computing – Mobile Computing through Internet – Making existing Applications Mobile Enabled.

UNIT –II:**Cellular Technologies: GSM, GPS, GPRS, CDMA and 3G:**

Bluetooth – Radio Frequency Identification – Wireless Broadband – Mobile IP – Internet Protocol Version 6 (IPv6) – Java Card – GSM Architecture – GSM Entities – Call Routing in GSM – PLMN Interfaces – GSM addresses and Identifiers – Network aspects in GSM – Authentication and Security – Mobile computing over SMS – GPRS and Packet Data Network – GPRS Network Architecture – GPRS Network Operations – Data Services in GPRS – Applications for GPRS – Limitations of GPRS – Spread Spectrum technology – Is-95 – CDMA Versus GSM – Wireless Data – Third Generation Networks – Applications on 3G

UNIT –III:**Wireless Application Protocol (WAP) and Wireless LAN:**

WAP – MMS – Wireless LAN Advantages – IEEE 802.11 Standards – Wireless LAN Architecture – Mobility in wireless LAN

Intelligent Networks and Interworking:

Introduction – Fundamentals of Call processing – Intelligence in the Networks – SS#7 Signaling – IN Conceptual Model (INCM) – soft switch – Programmable Networks – Technologies and Interfaces for IN

UNIT –IV:**Client Programming, Palm OS, Symbian OS, Win CE Architecture:**

Introduction – Moving beyond the Desktop – A Peek under the Hood: Hardware Overview – Mobile phones – PDA – Design Constraints in Applications for Handheld Devices – Palm OS architecture – Application Development – Multimedia – Symbian OS Architecture – Applications for Symbian, Different flavors of Windows CE -Windows CE Architecture

J2ME:

JAVA in the Handset – The Three-prong approach to JAVA Everywhere – JAVA 2 Micro Edition (J2ME) technology – Programming for CLDC – GUI in MIDP – UI Design Issues – Multimedia – Record Management System – Communication in MIDP – Security considerations in MIDP – Optional Packages



UNIT –V:

Voice Over Internet Protocol and Convergence:

Voice over IP- H.323 Framework for Voice over IP – Session Initiation Protocol – Comparison between H.323 and SIP – Real Time protocols – Convergence Technologies – Call Routing – Voice over IP Applications – IP multimedia subsystem (IMS) – Mobile VoIP

Security Issues in Mobile Computing:

Introduction – Information Security – Security Techniques and Algorithms – Security Protocols – Public Key Infrastructure – Trust – Security Models – Security frameworks for Mobile Environment

TEXT BOOKS:

1. Mobile Computing – Technology, Applications and Service Creation – Asoke K Talukder, Roopa R Yavagal, 2009, TATA McGraw Hill
2. Mobile Communications – Jochen Schiller – 2nd Edition – Pearson Education

REFERENCE BOOKS:

1. The CDMA 2000 System for Mobile Communications – VieriVaughni, Alexander Damn Jaonvic – Pearson
2. Adalestein - Fundamentals of Mobile &Parvasive Computing, 2008, TMH



I Year I Semester

L	T	P	C
3	0	0	3

**NETWORK SECURITY AND CRYPTOGRAPHY
(ELECTIVE -II)**

Course Outcomes:

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

1. Identify and utilize different forms of cryptography techniques.
2. Incorporate authentication and security in the network applications.
3. Distinguish among different types of threats to the system and handle the same.

UNIT -I:

Introduction:

Attacks, Services and Mechanisms, Security attacks, Security services, A Model for Internetwork security. Classical Techniques: Conventional Encryption model, Steganography, Classical Encryption Techniques.

Modern Techniques:

Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operations.

UNIT -II:

Encryption Algorithms:

Triple DES, International Data Encryption algorithm, Blowfish, RC5, CAST-128, RC2, Characteristics of Advanced Symmetric block ciphers. **Conventional Encryption:** Placement of Encryption function, Traffic confidentiality, Key distribution, Random Number Generation.

UNIT -III:

Public Key Cryptography: Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptography. **Number Theory:** Prime and Relatively prime numbers, Modular arithmetic, Fermat's and Euler's theorems, Testing for primality, Euclid's Algorithm, the Chinese remainder theorem, Discrete logarithms.

UNIT -IV:

Message Authentication and Hash Functions: Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs. **Hash and Mac Algorithms**

MD File, Message digest Algorithm, Secure Hash Algorithm, RIPEMD-160, HMAC. Digital signatures and Authentication protocols: Digital signatures, Authentication Protocols, Digital signature standards.

Authentication Applications : Kerberos, X.509 directory Authentication service. Electronic Mail Security: Pretty Good Privacy, S/MIME.

UNIT -V:





Overview, Architecture, Authentication, Encapsulating Security Payload, Combining security Associations, Key Management. Web Security: Web Security requirements, Secure sockets layer and Transport layer security, Secure Electronic Transaction.

Intruders, Viruses and Worms

Intruders, Viruses and Related threats.

Fire Walls: Fire wall Design Principles, Trusted systems.

TEXT BOOKS:

1. Cryptography and Network Security: Principles and Practice - William Stallings, Pearson Education.
2. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.

REFERENCE BOOKS:

1. Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
2. Network Security - Private Communication in a Public World by Charlie Kaufman, Radia Perlman and Mike Speciner, Pearson/PHI.
3. Principles of Information Security, Whitman, Thomson.
4. Network Security: The complete reference, Robert Bragg, Mark Rhodes, TMH
5. Introduction to Cryptography, Buchmann, Springer.

Course Outcomes:

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

1. Identify and utilize different forms of cryptography techniques.
2. Incorporate authentication and security in the network applications.
3. Distinguish among different types of threats to the system and handle the same.

**I Year I Semester**

L	T	P	C
0	0	4	2

DATA COMMUNICATIONS LAB**List of Experiments:**

1. Study of serial interface RS – 232
2. Study of pc to pc communication using parallel port
3. To establish pc-pc communication using LAN
4. Study of LAN using star topology, bus topology and tree topology
5. Study and configure modem of a computer
6. To configure a hub/switch
7. To study the interconnections of cables for data communication
8. Study of a wireless communication system
9. Set up of time division multiplexing using fiber optics
10. Digital Fiber Optical Transmitter and Receiver

**I Year I Semester**

L	T	P	C
0	0	4	2

Advanced Digital Signal processing lab**List of Experiments:**

1. Basic Signal Representation
2. Correlation Auto And Cross
3. Stability Using Hurwitz Routh Criteria
4. Sampling FFT Of Input Sequence
5. Butterworth Low pass And High pass Filter Design
6. Chebychev Type I,II Filter
7. State Space Matrix from Differential Equation
8. Normal Equation Using Levinson Durbin
9. Decimation And Interpolation Using Rationale Factors
10. Maximally Decimated Analysis DFT Filter
11. Cascade Digital IIR Filter Realization
12. Convolution And M Fold Decimation & PSD Estimator
13. Estimation Of PSD
14. Inverse Z Transform
15. Group Delay Calculation
16. Separation Of T/F
17. Parallel Realization of IIR filter

Course Outcomes:

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

1. Design different digital filters in software
2. Apply various transforms in time and frequency
3. Perform decimation and interpolation

**I Year I Semester**

L	T	P	C
2	0	0	2

Research Methodology and IPR**Syllabus Contents:**

Unit 1: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem.

Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

Unit 2: Effective literature studies approaches, analysis

Plagiarism, Research ethics,

Unit 3: Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

Unit 4: Nature of Intellectual Property: Patents, Designs, Trademarks and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development.

International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Unit 5: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

Unit 6: New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

References:

- Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students"
- Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
- Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
- Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd, 2007.
- Mayall, "Industrial Design", McGraw Hill, 1992.
- Niebel, "Product Design", McGraw Hill, 1974.
- Asimov, "Introduction to Design", Prentice Hall, 1962.
- Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016.
- T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

Course Outcomes:

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

1. Understand research problem formulation.
2. Analyze research related information
3. Follow research ethics
4. Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
5. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasize the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
6. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits




I Year II Semester

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WIRELESS COMMUNICATIONS AND NETWORKS

COURSE OBJECTIVES:

This course aims to develop:

1. An understanding on functioning of wireless communication system and evolution of different wireless communication systems and standards.
2. An ability to compare recent technologies used for wireless communication.
3. An ability to explain the architecture, functioning, protocols, capabilities and application of various wireless communication networks.
4. An ability to explain multiple access techniques for Wireless Communication
5. An ability to evaluate design challenges, constraints and security issues associated with Ad-hoc wireless networks.

UNIT -I:

The Cellular Concept-System Design Fundamentals:

Introduction, Frequency Reuse, Interference and system capacity – Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference, Power Control for Reducing interference, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring, Channel Assignment Strategies, Handoff Strategies- Prioritizing Handoffs, Practical Handoff Considerations, Trunking and Grade of Service

UNIT –II:

Mobile Radio Propagation: Large-Scale Path Loss:

Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, Basic Propagation Mechanisms, **Reflection**: Reflection from Dielectrics, Brewster Angle, Reflection from perfect conductors, Ground Reflection (Two-Ray) Model, **Diffraction**: Fresnel Zone Geometry, Knife-edge Diffraction Model, Multiple knife-edge Diffraction, Scattering, Outdoor Propagation Models- Longley-Ryze Model, Okumura Model, Hata Model, PCS Extension to Hata Model, Walfisch and Bertoni Model, Wideband PCS Microcell Model, Indoor Propagation Models- Partition losses (Same Floor), Partition losses between Floors, Log-distance path loss model, Ericsson Multiple Breakpoint Model, Attenuation Factor Model, Signal penetration into buildings, Ray Tracing and Site Specific Modeling.

UNIT –III:

Mobile Radio Propagation: Small –Scale Fading and Multipath

Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel- Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath Fading Channels-Clarke's model for flat fading, spectral shape due to Doppler spread in Clarke's model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.

**UNIT -IV:****Equalization and Diversity**

Introduction, Fundamentals of Equalization, Training a Generic Adaptive Equalizer, Equalizers in a communication Receiver, Linear Equalizers, Non-linear Equalization-Decision Feedback Equalization (DFE), Maximum Likelihood Sequence Estimation (MLSE) Equalizer, Algorithms for adaptive equalization-Zero Forcing Algorithm, Least Mean Square Algorithm, Recursive least squares algorithm. Diversity -Derivation of selection Diversity improvement, Derivation of Maximal Ratio Combining improvement, Practical Space Diversity Consideration-Selection Diversity, Feedback or Scanning Diversity, Maximal Ratio Combining, Equal Gain Combining, Polarization Diversity, Frequency Diversity, Time Diversity, RAKE Receiver.

UNIT -V:**Wireless Networks**

Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11, IEEE 802.11 Medium Access Control, Comparison of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, HiperLan, WLL.

TEXT BOOKS:

1. Wireless Communications, Principles, Practice – Theodore, S. Rappaport, 2nd Ed., 2002, PHI.
2. Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press.
3. Mobile Cellular Communication – GottapuSasibhushanaRao, Pearson Education, 2012.

REFERENCE BOOKS:

1. Principles of Wireless Networks – KavehPahLaven and P. Krishna Murthy, 2002, PE
2. Wireless Digital Communications – KamiloFeher, 1999, PHI.
3. Wireless Communication and Networking – William Stallings, 2003, PHI.
4. Wireless Communication – UpenDalal, Oxford Univ. Press
5. Wireless Communications and Networking – Vijay K. Gary, Elsevier.

Course Outcomes:

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

1. Understand Cellular communication concepts
2. Study the mobile radio propagation
3. Study the wireless network different type of MAC protocols

**IMAGE AND VIDEO PROCESSING****Course objectives:**

1. The basic concepts and methods to develop foundation in digital image processing and video processing are introduced and The Importance of various image transforms, image transform properties are discussed.
2. Understanding the image enhancement techniques in both spatial domain and frequency domain.
3. The process of recovering image that has been degraded by noise or any other degradation phenomenon.
4. Understanding the importance of image segmentation and various methods used for segmentation, The importance of reducing the data for digital image representation by using various image compression techniques
5. To understand the importance of video processing in multimedia and the various video formation models, motion estimation techniques in video processing
6. Applications of motion estimation in video processing

UNIT –I:**Fundamentals of Image Processing and Image Transforms:**

Introduction, Image sampling, Quantization, Resolution, Image file formats, Elements of image processing system, Applications of Digital image processing

Introduction, Need for transform, image transforms, Fourier transform, 2 D Discrete Fourier transform and its transforms, Importance of phase, Walsh transform, Hadamard transform, Haar transform, slant transform Discrete cosine transform, KL transform, singular value decomposition, Radon transform, comparison of different image transforms.

UNIT –II:**Image Enhancement:**

Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters.

Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering.

Image Restoration:

Introduction to Image restoration, Image degradation, Types of image blur, Classification of image restoration techniques, Image restoration model, Linear and Nonlinear image restoration techniques, Blind deconvolution

UNIT –III:**Image Segmentation:**

Introduction to image segmentation, Point, Line and Edge Detection, Region based segmentation., Classification of segmentation techniques, Region approach to image segmentation, clustering techniques, Image segmentation based on thresholding, Edge based segmentation, Edge detection and linking, Hough transform, Active contour

Image Compression:

Introduction, Need for image compression, Redundancy in images, Classification of redundancy in images, image compression scheme, Classification of image compression schemes, Fundamentals of information theory, Run length coding, Shannon – Fano coding, Huffman coding, Arithmetic coding, Predictive coding, Transformed based compression, Image compression standard, Wavelet-based image



**UNIT -IV:****Basic Steps of Video Processing:**

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

UNIT -V:**2-D Motion Estimation:**

Optical flow, General Methodologies, Pixel Based Motion Estimation, Block- Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Video coding.

TEXT BOOKS:

1. Digital Image Processing – Gonzaleze and Woods, 3rd Ed., Pearson.
2. Video Processing and Communication – Yao Wang, JoemOstermann and Ya–quin Zhang. 1st Ed., PH Int.
3. S.Jayaraman, S.Esakkirajan and T.VeeraKumar, "Digital Image processing, Tata McGraw Hill publishers, 2009

REFERENCE BOOKS:

1. Digital Image Processing and Analysis-Human and Computer Vision Application with CVIP Tools – ScotteUmbaugh, 2nd Ed, CRC Press, 2011.
2. Digital Video Processing – M. Tekalp, Prentice Hall International.
3. Digital Image Processing – S.Jayaraman, S.Esakkirajan, T.Veera Kumar – TMH, 2009.
4. Multidimentional Signal, Image and Video Processing and Coding – John Woods, 2nd Ed, Elsevier.
5. Digital Image Processing with MATLAB and Labview – Vipula Singh, Elsevier.
6. Video Demystified – A Hand Book for the Digital Engineer – Keith Jack, 5th Ed., Elsevier.

Course Outcomes:

1. Defining the digital image, representation of digital image, importance of image resolution, applications in image processing.
2. Know the advantages of representation of digital images in transform domain, application of various image transforms.
3. Know how an image can be enhanced by using histogram techniques, filtering techniques etc
4. Understand image degradation, image restoration techniques using spatial filters and frequency domain
5. Know the detection of point, line and edges in images, edge linking through local processing, global processing.
6. Understand the redundancy in images, various image compression techniques.
7. Know the video technology from analog color TV systems to digital video systems, how video signal is sampled and filtering operations in video processing.
8. Know the general methodologies for 2D motion estimation, various coding used in video processing.

**SOFT COMPUTING TECHNIQUES****(ELECTIVE -III)****UNIT –I:****Introduction:**

Approaches to intelligent control, Architecture for intelligent control, Symbolic reasoning system, Rule-based systems, the AI approach, Knowledge representation - Expert systems.

UNIT –II:**Artificial Neural Networks:**

Concept of Artificial Neural Networks and its basic mathematical model, McCulloch-Pitts neuron model, simple perceptron, Adaline and Madaline, Feed-forward Multilayer Perceptron, Learning and Training the neural network, Data Processing: Scaling, Fourier transformation, principal-component analysis and wavelet transformations, Hopfield network, Self-organizing network and Recurrent network, Neural Network based controller.

UNIT –III:**Fuzzy Logic System:**

Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning, Introduction to fuzzy logic modeling and control, Fuzzification, inferencing and defuzzification, Fuzzy knowledge and rule bases, Fuzzy modeling and control schemes for nonlinear systems, Self-organizing fuzzy logic control, Fuzzy logic control for nonlinear time delay system.

UNIT –IV:**Genetic Algorithm:**

Basic concept of Genetic algorithm and detail algorithmic steps, Adjustment of free parameters, Solution of typical control problems using genetic algorithm, Concept on some other search techniques like Tabu search and ant-colony search techniques for solving optimization problems.

UNIT –V:**Applications:**

GA application to power system optimisation problem, Case studies: Identification and control of linear and nonlinear dynamic systems using MATLAB-Neural Network toolbox, Stability analysis of Neural-Network interconnection systems, Implementation of fuzzy logic controller using MATLAB fuzzy-logic toolbox, Stability analysis of fuzzy control systems.

TEXT BOOKS:

1. Introduction to Artificial Neural Systems - Jacek.M.Zurada, Jaico Publishing House, 1999.
2. Neural Networks and Fuzzy Systems - Kosko, B., Prentice-Hall of India Pvt. Ltd., 1994.



REFERENCE BOOKS:

1. Fuzzy Sets, Uncertainty and Information - Klir G.J. & Folger T.A., Prentice-Hall of India Pvt. Ltd., 1993.
2. Fuzzy Set Theory and Its Applications - Zimmerman H.J. Kluwer Academic Publishers, 1994.
3. Introduction to Fuzzy Control - Driankov, Hellendroon, Narosa Publishers.
4. Artificial Neural Networks - Dr. B. Yagananarayana, 1999, PHI, New Delhi.
5. Elements of Artificial Neural Networks - Kishan Mehrotra, Chelkuri K. Mohan, Sanjay Ranka, Penram International.
6. Artificial Neural Network – Simon Haykin, 2nd Ed., Pearson Education.
7. Introduction Neural Networks Using MATLAB 6.0 - S.N. Shivanandam, S. Sumati, S. N. Deepa, I/e, TMH, New Delhi.

Course Outcomes

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

1. Understand the basic concepts of Artificial neural network systems.
2. Understand the McCulloch-Pitts neuron model, simple and multilayer Perception, Adeline and Madeline concepts.
3. Data processing, Hopfield and self-organizing network.
4. Difference between crisp sets to fuzzy sets, fuzzy models, fuzzification, inference, membership functions, rule based approaches and defuzzification.
5. Self – organizing fuzzy logic control, non linear time delay systems.
6. Understand the concept of Genetic Algorithm steps, Tabu, and colony search techniques for solving optimization problems.
7. GA applications to power system optimization problems, identification and control of linear and nonlinear dynamic systems using MATLAB-Neural network toolbox.
8. Know the application and importance stability analysis

**I Year II Semester**

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INTERNET PROTOCOLS (ELECTIVE III)

UNIT -I:**Internetworking Concepts:**

Principles of Internetworking, Connectionless Internetworking, Application level Interconnections, Network level Interconnection, Properties of the Internet, Internet Architecture, Wired LANs, Wireless LANs, Point-to-Point WANs, Switched WANs, Connecting Devices, TCP/IP Protocol Suite.

IP Address:

Classfull Addressing: Introduction, Classfull Addressing, Other Issues, Sub-netting and Super-netting

Classless Addressing: Variable length Blocks, Sub-netting, Address Allocation. Delivery, Forwarding, and Routing of IP Packets: Delivery, Forwarding, Routing, Structure of Router.

ARP and RARP: ARP, ARP Package, RARP.

UNIT -II:

Internet Protocol (IP): Datagram, Fragmentation, Options, Checksum, IP V.6.

Transmission Control Protocol (TCP): TCP Services, TCP Features, Segment, A TCP Connection, State Transition Diagram, Flow Control, Error Control, Congestion Control, TCP Times.

Stream Control Transmission Protocol (SCTP): SCTP Services, SCTP Features, Packet Format, Flow Control, Error Control, Congestion Control.

Mobile IP: Addressing, Agents, Three Phases, Inefficiency in Mobile IP.

Classical TCP Improvements: Indirect TCP, Snooping TCP, Mobile TCP, Fast Retransmit/ Fast Recovery, Transmission/ Time Out Freezing, Selective Retransmission, Transaction Oriented TCP.

UNIT -III:

Unicast Routing Protocols (RIP, OSPF, and BGP): Intra and Inter-domain Routing, Distance Vector Routing, RIP, Link State Routing, OSPF, Path Vector Routing, BGP.

Multicasting and Multicast Routing Protocols: Unicast - Multicast- Broadcast, Multicast Applications, Multicast Routing, Multicast Link State Routing: MOSPF, Multicast Distance Vector: DVMRP.

UNIT -IV:

Domain Name System (DNS): Name Space, Domain Name Space, Distribution of Name Space, and DNS in the internet.

Remote Login TELNET: Concept, Network Virtual Terminal (NVT).

File Transfer FTP and TFTP: File Transfer Protocol (FTP).

Electronic Mail: SMTP and POP.

Network Management-SNMP: Concept, Management Components, World Wide Web- HTTP Architecture.



UNIT -V:

Multimedia:

Digitizing Audio and Video, Network security, security in the internet firewalls. Audio and Video Compression, Streaming Stored Audio/Video, Streaming Live Audio/Video, Real-Time Interactive Audio/Video, RTP, RTCP, Voice Over IP. Network Security, Security in the Internet, Firewalls.

TEXT BOOKS:

1. TCP/IP Protocol Suite- Behrouz A. Forouzan, Third Edition, TMH
2. Internetworking with TCP/IP Comer 3 rd edition PHI

REFERENCE BOOKS:

1. High performance TCP/IP Networking- Mahbub Hassan, Raj Jain, PHI, 2005
2. Data Communications & Networking – B.A. Forouzan– 2nd Edition – TMH
3. High Speed Networks and Internets- William Stallings, Pearson Education, 2002.
4. Data and Computer Communications, William Stallings, 7th Edition., PEI.
5. The Internet and Its Protocols – AdrinFarrel, Elsevier, 2005.

Course outcomes:

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

1. Understanding basic network routing concepts and algorithms;
2. Understanding how to apply them into given topologies;
3. Understanding how the Internet protocol suite operates; describe the functions of various protocols
4. Explain the concept and usage of node addressing; classify addresses into network layers.

**I Year II Semester**

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**CYBER SECURITY
(ELECTIVE III)**
UNIT I:**Introduction:**

Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security, Internet Standards and RFCs, Buffer overflow & format string vulnerabilities, TCP session hijacking, ARP attacks, route table modification, UDP hijacking, and man-in-the-middle attacks.

UNIT II :**Conventional Encryption:**

Conventional Encryption Principles, Conventional encryption algorithms, cipher block modes of operation, location of encryption devices, key distribution Approaches of Message Authentication, Secure Hash Functions and HMAC

UNIT III :

Number Theory: Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorems, The Chinese Remainder theorem, Discrete logarithms

Public key: Public key cryptography principles, public key cryptography algorithms, digital signatures, digital Certificates, Certificate Authority and key management Kerberos, X.509 Directory Authentication Service

UNIT IV :

IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management

Transport Level Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET) **Email Privacy:** Pretty Good Privacy (PGP) and S/MIME.

UNIT V:

Intrusion Detection: Intruders, Intrusion Detection systems, Password Management.

Malicious Software: Viruses and related threats & Countermeasures.

Fire walls: Firewall Design principles, Trusted Systems.

TEXT BOOKS:

Network Security & Cryptography: Principles and Practices, William Stallings, PEA, Sixth edition.
Hack Proofing your Network, Russell, Kaminsky, Forest Puppy, Wiley Dreamtech



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FirstRanker's choice



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

REFERENCE BOOKS:

1. Network Security & Cryptography, Bernard Menezes, Cengage, 2010

Course outcomes:

1. Cyber Security architecture principles
2. Identifying System and application security threats and vulnerabilities
3. Identifying different classes of attacks
4. Cyber Security incidents to apply appropriate response
5. Describing risk management processes and practices 6. Evaluation of decision making outcomes of Cyber Security scenario



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**I Year II Semester**

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OPTICAL NETWORKS
(ELECTIVE – IV)

UNIT –I:**Client Layers of Optical Networks:**

SONET / SDH – Multiplexing, Frame Structure, Physical Layer, Infrastructure, ATM – Functions, Adaptation layers, QoS, Flow Control Signaling and Routing, IP – Routing, QoS, MPLS, Storage Area Networks – ESCON, Fiber Channel, HIPPI, Gigabit Ethernet.

UNIT -II:**WDM network Elements and Design:**

Optical Line Terminals and Amplifiers, Add/Drop Multiplexers, Optical Cross Connects, Cost trade-offs in Network Design, LTD and RWA Problems, Dimensioning – Wavelength Routing Networks, Statistical and Maximum Load Dimensioning Models.

UNIT –III:**Network Control and Management:**

Network Management Functions, Optical Layer Services and Interfacing, Layers within Optical Layer, Multivendor Interoperability, Performance and Fault Management, Configuration Management, Optical Safety.

Unit –IV:**Network Survivability:**

Basic Concepts of Survivability, Protection in SONET/SDH Links and Rings, Protection in IP Networks, Optical Layer Protection – Service Classes, Protection Schemes, Interworking between Layers.

UNIT –V:**Access Networks and Photonic Packet Switching:**

Network Architecture, Enhanced HFC, FTTC, Photonic Packet Switching – OTDM, Synchronization, Header Processing, Buffering, Burst Switching, Test Beds.

TEXT BOOKS:

1. Optical Networks: A Practical Perspective - Rajiv Ramaswami and Kumar N. Sivarajan, 2nd Ed., 2004, Elsevier Morgan Kaufmann Publishers (An Imprint of Elsevier).
2. WDM Optical Networks: Concepts, Design and Algorithms – C. Siva Rama Murthy and Mohan Guruswamy 2nd Ed., 2003, PEI.
3. Optical Networks: Third Generation Transport Systems – Uyles Black, 2nd Ed., 2009, PEI.



REFERENCE BOOKS:

1. Optical Fiber Communications: Principles and Practice – John.M.Senior, 2nd Ed., 2000, PE.
2. Fiber Optics Communication – Harold Kolimbris, 2nd Ed., 2004, PEI.
3. Networks – Timothy S. Ramteke, 2 ed., 2004, PEI.
4. Optical Fiber Communications – GovindAgarwal, 2nd Ed., 2004, TMH.
5. Optical Fiber Communications and Its Applications – S.C.Gupta, 2004, PHI.
6. Telecommunication System Engineering –Roger L.Freeman, 4th Ed., John Wiley, 2004

Course Outcomes:

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

1. Contribute in the areas of optical network and WDM network design.
2. Implement simple optical network and understand further technology developments for future enhanced network.

**I Year II Semester**

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**DSP PROCESSORS AND ARCHITECTURES
(ELECTIVE -IV)****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.

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.

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:**Analog Devices Family of DSP Devices:**

Analog Devices Family of DSP Devices – ALU and MAC block diagram, Shifter Instruction, Base Architecture of ADSP 2100, ADSP-2181 high performance Processor.

Introduction to Blackfin Processor - The Blackfin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files, Address Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals.

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).



TEXT BOOKS:

1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. A Practical Approach to Digital Signal Processing - K Padmanabhan, R. Vijayarajeswaran, Ananthi. S, New Age International, 2006/2009
3. EmbeddedSignalProcessingwiththeMicroSignalArchitecturePublisher: Woon-SengGan, Sen M. Kuo, Wiley-IEEE Press, 2007

REFERENCE BOOKS:

1. Digital Signal Processors, Architecture, Programming and Applications – B. Venkataramani and M. Bhaskar, 2002, TMH.
2. Digital Signal Processing –Jonatham Stein, 2005, John Wiley.
3. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. 2000, S. Chand & Co.
4. Digital Signal Processing Applications Using the ADSP-2100 Family by The Applications Engineering Staff of Analog Devices, DSP Division, Edited by Amy Mar, PHI
5. *The Scientist and Engineer's Guide to Digital Signal Processing* by Steven W. Smith, Ph.D., California Technical Publishing, ISBN 0-9660176-3-3, 1997
6. *Embedded Media Processing* by David J. Katz and Rick Gentile of Analog Devices, Newnes , ISBN 0750679123, 2005

Course Outcomes:

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

1. Identify and formalize architectural level characterization of P-DSP hardware
2. Ability to design, programming (assembly and C), and testing code using Code Composer Studio environment
3. Deployment of DSP hardware for Control, Audio and Video Signal processing applications
4. Understanding of major areas and challenges in DSP-based embedded systems.

**I Year II Semester**

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RADIO AND NAVIGATIONAL AIDS
(ELECTIVE-IV)

UNIT –I:**Navigational Systems:**

Review of Navigational Systems: Aircraft navigational system, Geometry of the earth. Navigation equation, Navigation errors, Radio navigation system types and Performance parameters, ILS System, Hyperbolic navigation systems, Loran, Omega, Decca Radio direction finding, DME, TACAN and VORTAC.

UNIT -II:**Inertial Navigation:**

Inertial navigation system, Sensing instruments: Accelerometer. Gyroscopes, Analytic and Gimbaled platforms, Mechanization, Error analysis, Alignment.

UNIT –III:**Global Positioning System (GPS) for Navigation:**

Overview of GPS, Reference systems. Satellite orbits, Signal structure, Geometric dilution of precision (GDOP), or Precision dilution of precision (PDOP), Satellite ephemeris, Satellite clock, Ionospheric group delay. Tropospheric group delay, Multipath errors and Receiver measurement errors.

UNIT -IV:**Differential GPS and WAAS:**

Standard and precise positioning service local area DGPS and Wide area DGPS errors, Wide Area Augmentation System (WAAS) architecture, Link budget and Data Capacity, Ranging function, Precision approach and error estimates.

UNIT –V:**GPS Navigational Applications:**

General applications of GPS, DGPS, Marine, Air and Land Navigation, Surveying, Mapping and Geographical information systems, Military and Space.

TEXT BOOKS:

1. Myron Kavton and Walter Friend, R. - "Avionics Navigation Systems", Wiley, 1997
2. Parkinson. BW. Spilker - "Global Positioning System Theory and Applications", Progress in Astronautics, Vol. I and II, 1996.

REFERENCE BOOKS:

1. Hoffman. B., Wellenhof. H... Lichtenegger and J. Collins - "GPS Theory and Practice", Springer Verlag Wien New York, 1992.
2. Elliot D. Kaplan - "Understanding GPS Principles and Applications", Artech House. Inc., 1996.
3. Lieck Alfred. - "GPS Satellite Surveying", John Wiley, 1990.

**I Year II Semester**

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ADVANCED COMMUNICATIONS LAB**Note:**

- A. Minimum of 10 Experiments have to be conducted
- B. All Experiments may be Simulated using MATLAB and to be verified using related training kits.
1. Measurement of Bit Error Rate using Binary Data
 2. Verification of minimum distance in Hamming code
 3. Determination of output of Convolutional Encoder for a given sequence
 4. Determination of output of Convolutional Decoder for a given sequence
 5. Efficiency of DS Spread- Spectrum Technique
 6. Simulation of Frequency Hopping (FH) system
 7. Effect of Sampling and Quantization of Digital Image
 8. Verification of Various Transforms (FT / DCT/ Walsh / Hadamard) on a given Image (Finding Transform and Inverse Transform)
 9. Point, Line and Edge detection techniques using derivative operators.
 10. Implementation of FIR filter using DSP Trainer Kit (C-Code/ Assembly code)
 11. Implementation of IIR filter using DSP Trainer Kit (C-Code/ Assembly code)
 12. Determination of Losses in Optical Fiber
 13. Observing the Waveforms at various test points of a mobile phone using Mobile Phone Trainer
 14. Study of Direct Sequence Spread Spectrum Modulation & Demodulation using CDMA-DSS-BER Trainer
 15. Study of ISDN Training System with Protocol Analyzer
 16. Characteristics of LASER Diode.

Course Outcomes:

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

1. Identify the different types of network devices and their functions within a network.
2. Understand and build the skills of sub-netting and routing mechanisms.
3. Understand basic protocols of computer networks, and how they can be used to assist in network design and implementation.
- 4.



I Year II Semester

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Advanced Digital Image and Video Processing lab

List of Experiments:

1. Perform basic operations on images like addition, subtraction etc.
2. Plot the histogram of an image and perform histogram equalization
3. Implement segmentation algorithms
4. Perform video enhancement
5. Perform video segmentation
6. Perform image compression using lossy technique
7. Perform image compression using lossless technique
8. Perform image restoration
9. Convert a colour model into another
10. Calculate boundary features of an image
11. Calculate regional features of an image
12. Detect an object in an image/video using template matching/Bayes classifier

Course Outcomes:

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

1. Perform image and video enhancement
2. Perform image and video segmentation
3. Detect an object in an image/video



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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I Year II Semester

L	T	P	C
2	0	0	0

MINI PROJECT WITH SEMINAR

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III Semester

L	T	P	C
3	0	0	3

DETECTION AND ESTIMATION THEORY (ELECTIVE V)

UNIT –I:**Random Processes:**

Discrete Linear Models, Markov Sequences and Processes, Point Processes, and Gaussian Processes.

UNIT –II:**Detection Theory:**

Basic Detection Problem, Maximum A posteriori Decision Rule, Minimum Probability of Error Classifier, Bayes Decision Rule, Multiple-Class Problem (Bayes)- minimum probability error with and without equal a priori probabilities, Neyman-Pearson Classifier, General Calculation of Probability of Error, General Gaussian Problem, Composite Hypotheses.

UNIT –III:**Linear Minimum Mean-Square Error Filtering:**

Linear Minimum Mean Squared Error Estimators, Nonlinear Minimum Mean Squared Error Estimators. Innovations, Digital Wiener Filters with Stored Data, Real-time Digital Wiener Filters, Kalman Filters.

UNIT –IV:**Statistics:**

Measurements, Nonparametric Estimators of Probability Distribution and Density Functions, Point Estimators of Parameters, Measures of the Quality of Estimators, Introduction to Interval Estimates, Distribution of Estimators, Tests of Hypotheses, Simple Linear Regression, Multiple Linear Regression.

UNIT –V:**Estimating the Parameters of Random Processes from Data:**

Tests for Stationarity and Ergodicity, Model-free Estimation, Model-based Estimation of Autocorrelation Functions, Power Spectral Density Functions.

TEXT BOOKS:

1. Random Signals: Detection, Estimation and Data Analysis - K. Sam Shanmugan & A.M. Breipohl, Wiley India Pvt. Ltd, 2011.
2. Random Processes: Filtering, Estimation and Detection - Lonnie C. Ludeman, Wiley India Pvt. Ltd., 2010.



REFERENCE BOOKS:

1. Fundamentals of Statistical Signal Processing: Volume I Estimation Theory– Steven.M.Kay, Prentice Hall, USA, 1998.
2. Fundamentals of Statistical Signal Processing: Volume I Detection Theory– Steven.M.Kay, Prentice Hall, USA, 1998.
3. Introduction to Statistical Signal Processing with Applications - Srinath, Rajasekaran, Viswanathan, 2003, PHI.
4. Statistical Signal Processing: Detection, Estimation and Time Series Analysis – Louis L.Scharf, 1991, Addison Wesley.
5. Detection, Estimation and Modulation Theory: Part – I – Harry L. Van Trees, 2001, John Wiley & Sons, USA.
6. Signal Processing: Discrete Spectral Analysis – Detection & Estimation – Mischa Schwartz, Leonard Shaw, 1975, McGraw Hill.

Course Outcomes:

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

1. Simulate signals and noise
2. Detect signals in the presence of noise
3. Compare various estimation techniques



III Semester

L	T	P	C
3	0	0	3

CODING THEORY AND APPLICATIONS (ELECTIVE V)

UNIT –I:**Coding for Reliable Digital Transmission and Storage:**

Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.

Linear Block Codes:

Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system

UNIT –II:**Cyclic Codes:**

Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding ,Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

UNIT –III:**Convolutional Codes:**

Encoding of Convolutional Codes, Structural and Distance Properties, maximum likelihood decoding, Sequential decoding, Majority- logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

UNIT –IV:**Burst –Error-Correcting Codes:**

Decoding of Single-Burst error Correcting Cyclic codes, Single-Burst-Error-Correcting Cyclic codes, Burst-Error-Correcting Convolutional Codes, Bounds on Burst Error-Correcting Capability, Interleaved Cyclic and Convolutional Codes, Phased-Burst –Error-Correcting Cyclic and Convolutional codes.

UNIT -V:**BCH – Codes:**

BCH code- Definition, Minimum distance and BCH Bounds, Decoding Procedure for BCH Codes- Syndrome Computation and Iterative Algorithms, Error Location Polynomials and Numbers for single and double error correction

TEXT BOOKS:

1. Error Control Coding- Fundamentals and Applications –Shu Lin, Daniel J.Costello,Jr, Prentice Hall, Inc.
2. Error Correcting Coding Theory-Man Young Rhee- 1989, McGraw-Hill Publishing.



REFERENCE BOOKS:

1. Digital Communications-Fundamental and Application - Bernard Sklar, PE.
2. Digital Communications- John G. Proakis, 5th Ed., 2008, TMH.
3. Introduction to Error Control Codes-Salvatore Gravano-oxford
4. Error Correction Coding – Mathematical Methods and Algorithms – Todd K.Moon, 2006, Wiley India.
5. Information Theory, Coding and Cryptography – Ranjan Bose, 2nd Ed, 2009, TMH.

Course Outcomes:

On completion of this course student will be able to

1. Learning the measurement of information and errors.
2. Obtain knowledge in designing Linear Block Codes and Cyclic codes.
3. Construct tree and trellis diagrams for convolution codes
4. Design the Turbo codes and Space time codes and also their applications

**II Year III Semester**

L	T	P	C
3	0	0	3

**SOFTWARE DEFINED RADIO
(ELECTIVE V)**

UNIT -I:**Introduction:**

The Need for Software Radios, What is Software Radio, Characteristics and benefits of software radio- Design Principles of Software Radio, RF Implementation issues- The Purpose of RF Front – End, Dynamic Range- The Principal Challenge of Receiver Design – RF Receiver Front- End Topologies- Enhanced Flexibility of the RF Chain with Software Radios- Importance of the Components to Overall Performance- Transmitter Architectures and Their Issues- Noise and Distortion in the RF Chain, ADC and DAC Distortion.

UNIT -II:**Multi Rate Signal Processing:**

Introduction- Sample Rate Conversion Principles- Polyphase Filters- Digital Filter Banks- Timing Recovery in Digital Receivers Using Multirate Digital Filters.

Digital Generation of Signals:

Introduction- Comparison of Direct Digital Synthesis with Analog Signal Synthesis- Approaches to Direct Digital Synthesis- Analysis of Spurious Signals- Spurious Components due to Periodic jitter- Band Pass Signal Generation- Performance of Direct Digital Synthesis Systems- Hybrid DDS-PLL Systems- Applications of direct Digital Synthesis- Generation of Random Sequences- ROM Compression Techniques.

UNIT -III:**Analog to Digital and Digital to Analog Conversion:**

Parameters of ideal data converters- Parameters of Practical data converters- Analog to Digital and Digital to Analog Conversion- Techniques to improve data converter performance- Common ADC and DAC architectures.

UNIT -IV:**Digital Hardware Choices:**

Introduction- Key Hardware Elements- DSP Processors- Field Programmable Gate Arrays- Trade-Offs in Using DSPs, FPGAs, and ASICs- Power Management Issues- Using a Combination of DSPs, FPGAs, and ASICs.

UNIT -V:**Object – Oriented Representation of Radios and Network Resources:**

Networks- Object Oriented Programming- Object Brokers- Mobile Application Environments- Joint Tactical Radio System.

Case Studies in Software Radio Design: Introduction and Historical Perspective, SPEAK easy- JTRS, Wireless Information Transfer System, SDR-3000 Digital Transceiver Subsystem, Spectrum Ware, CHARIOT.



TEXT BOOKS:

1. Software Radio: A Modern Approach to Radio Engineering - Jeffrey H. Reed, 2002, PEA Publication.
2. Software Defined Radio: Enabling Technologies- Walter Tuttle Bee, 2002, Wiley Publications.

REFERENCE BOOKS:

1. Software Defined Radio for 3G - Paul Burns, 2002, Artech House.
2. Software Defined Radio: Architectures, Systems and Functions - Markus Dillinger, KambizMadani, Nancy Alonistioti, 2003, Wiley.
3. Software Radio Architecture: Object Oriented Approaches to wireless System Engineering – Joseph Mitola, III, 2000, John Wiley & Sons.
4. R.F Microelectronics – B. Razavi, 1998, PHI.
5. DSP – A Computer Based Approach – S. K. Mithra, 1998, McGraw-Hill.


III Semester

L	T	P	C
0	0	20	10

(DISSERTATION) DISSERTATION PHASE – I AND PHASE – II
Syllabus Contents:

The dissertation / project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The dissertation should have the following

- Relevance to social needs of society
- Relevance to value addition to existing facilities in the institute
- Relevance to industry need
- Problems of national importance
- Research and development in various domain

The student should complete the following:

- Literature survey Problem Definition
- Motivation for study and Objectives
- Preliminary design / feasibility / modular approaches
- Implementation and Verification
- Report and presentation

The dissertation stage II is based on a report prepared by the students on dissertation allotted to them. It may be based on:

- Experimental verification / Proof of concept.
- Design, fabrication, testing of Communication System.
- The viva-voce examination will be based on the above report and work.

Guidelines for Dissertation Phase – I and II at M. Tech. (Electronics):

- As per the AICTE directives, the dissertation is a yearlong activity, to be carried out and evaluated in two phases i.e. Phase – I: July to December and Phase – II: January to June.
- The dissertation may be carried out preferably in-house i.e. department's laboratories and centers OR in industry allotted through department's T & P coordinator.
- After multiple interactions with guide and based on comprehensive literature survey, the student shall identify the domain and define dissertation objectives. The referred literature should preferably include IEEE/IET/IETE/Springer/Science Direct/ACM journals in the areas of Computing and Processing (Hardware and Software), Circuits-Devices and Systems, Communication-Networking and Security, Robotics and Control Systems, Signal Processing and Analysis and any other related domain. In case of Industry sponsored projects, the relevant application notes, while papers, product catalogues should be referred and reported.
- Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and phase wise work distribution, and submit the proposal within a month from the date of registration.
- Phase – I deliverables: A document report comprising of summary of literature survey, detailed objectives, project specifications, paper and/or computer aided design, proof of concept/functionality, part results, A record of continuous progress.



- Phase – I evaluation: A committee comprising of guides of respective specialization shall assess the progress/performance of the student based on report, presentation and Q &A. In case of unsatisfactory performance, committee may recommend repeating the Phase-I work.
- During phase – II, student is expected to exert on design, development and testing of the proposed work as per the schedule. Accomplished results/contributions/innovations should be published in terms of research papers in reputed journals and reviewed focused conferences OR IP/Patents.

Phase – II deliverables: A dissertation report as per the specified format, developed system in the form of hardware and/or software, a record of continuous progress.

- Phase – II evaluation: Guide along with appointed external examiner shall assess the progress/performance of the student based on report, presentation and Q &A. In case of unsatisfactory performance, committee may recommend for extension or repeating the work

Course Outcomes:

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

1. Ability to synthesize knowledge and skills previously gained and applied to an in-depth study and execution of new technical problem.
2. Capable to select from different methodologies, methods and forms of analysis to produce a suitable research design, and justify their design.

Ability to present the findings of their technical solution in a written report.

3. Presenting the work in International/ National conference or reputed journals.



OPEN ELECTIVES

BUSINESS ANALYTICS

Unit1:

Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of BusinessAnalytics.

Statistical Tools: Statistical Notation, Descriptive Statistical methods,

Review of probability distribution and data modelling, sampling and estimation methods overview.

Unit 2:

Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression.Important Resources, Business Analytics Personnel, Data and modelsfor Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology

Unit 3:

Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes.Descriptive Analytics, predictive analytics, predicative Modelling, Predictiveanalyticsanalysis,DataMining,Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

Unit 4:

Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models.

Monte Carlo Simulation and Risk Analysis: Monte CarleSimulation

Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

Unit 5:

Decision Analysis: Formulating Decision Problems, DecisionStrategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.

Recent Trends in : Embedded and collaborative business intelligence,Visual data recovery, Data Storytelling and Data journalism

Reference:

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FTPress.
2. Business Analytics by James Evans, personsEducation.

COURSE OUTCOMES

1. Students will demonstrate knowledge of dataanalytics.
2. Students will demonstrate the ability of think critically in making decisions based on data and deepanalytics.
3. Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support businessdecision-making.
4. Students will demonstrate the ability to translate data into clear, actionable insights

**III Semester**

L	T	P	C
3	0	0	3

OPENELECTIVES
INDUSTRIALSAFETY

Unit-1:

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

Unit-2:

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

Unit-3:

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Unit-4:

Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

Unit-5:

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

Reference:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London

**III Semester**

L	T	P	C
3	0	0	3

**OPENELECTIVES
OPERATIONS RESEARCH****Unit 1:**

Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models

Unit 2

Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming

Unit 3:

Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT

Unit 4

Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

Unit 5

Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

References:

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
4. Hitler Libermann Operations Research: McGraw Hill Pub. 2009
5. Pannerselvam, Operations Research: Prentice Hall of India 2010
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

Course Outcomes:

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

1. Students should able to apply the dynamic programming to solve problems of discreet and continuous variables.
2. Students should able to apply the concept of non-linear programming
3. Students should able to carry out sensitivity analysis
4. Student should able to model the real world problem and simulate it.


III Semester

L	T	P	C
3	0	0	3

OPEN ELECTIVE
COST MANAGEMENT OF ENGINEERING PROJECTS
Pre-requisite: MEFA & Management Science

Course Educational Objectives:

- To learn cost concepts in decision making
- To learn different stages and aspects of a project and execution
- To learn resources planning, quality management.
- To learn application of techniques such as linear programming, PERT/CPM
- To learn profit planning and budgeting

Unit I: Introduction and Overview of the Strategic Cost Management Process

Unit II: Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.

Unit III: Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process

Unit IV: Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

Unit V: Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

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

- Understand the cost management process and various costs involved in a project
- Analyze various aspects of a project like project site, project team, contracts, execution and commissioning
- Perform various costing and cost management and cost management, profit planning
- Apply linear programming PERT/CPM to cost management

Reference Books:

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

**III Semester**

L	T	P	C
3	0	0	3

**OPEN ELECTIVE
COMPOSITE MATERIALS****UNIT-I:**

INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT – II:

REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

UNIT – III:

Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. **Manufacturing of Ceramic Matrix Composites:** Liquid Metal Infiltration – Liquid phase sintering. **Manufacturing of Carbon – Carbon composites:** Knitting, Braiding, Weaving. Properties and applications.

UNIT-IV:

Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and preregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

UNIT – V:

Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first ply failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

TEXT BOOKS:

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.

References:

1. Hand Book of Composite Materials-ed-Lubin.
2. Composite Materials – K.K.Chawla.
3. Composite Materials Science and Applications – Deborah D.L.Chung.
4. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.

**III Semester**

L	T	P	C
3	0	0	3

**OPEN ELECTIVE
WASTE TO ENERGY**

Unit-I:

Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

Unit-II:

Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

Unit-III:

Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation

Unit-IV:

Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

Unit-V:

Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

References:

1. Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

**AUDIT 1 and 2: ENGLISH FOR RESEARCH PAPER WRITING****Course objectives:**

Students will be able to:

Understand that how to improve your writing skills and level of readability

Learn about what to write in each section

Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

Syllabus

Units	CONTENTS	Hours
1	Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness	4
2	Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction	4
3	Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.	4
4	key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,	4
5	skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions	4
6	useful phrases, how to ensure paper is as good as it could possibly be the first- time submission	4

Suggested Studies:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook .
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011


JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
AUDIT 1 and 2: DISASTER MANAGEMENT

Course Objectives: -Students will be able to:
 learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
 critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
 develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
 critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

Syllabus

Units	CONTENTS	Hours
1	Introduction Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.	4
2	Repercussions Of Disasters And Hazards: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.	4
3	Disaster Prone Areas In India Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics	4
4	Disaster Preparedness And Management Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.	4
5	Risk Assessment Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.	4



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

6	Disaster Mitigation Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.	4
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Suggested Readings:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies" "New Royal book Company.
2. Sahni, PardeepEt.Al. (Eds.), "Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.
3. Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep &Deep Publication Pvt. Ltd., New Delhi.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

AUDIT 1 and 2: SANSKRIT FOR TECHNICAL KNOWLEDGE

Course Objectives

1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
2. Learning of Sanskrit to improve brain functioning
3. Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
4. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Syllabus

Unit	Content	Hours
1	<ul style="list-style-type: none">• Alphabets in Sanskrit,• Past/Present/Future Tense,• Simple Sentences	8
2	<ul style="list-style-type: none">• Order• Introduction of roots• Technical information about Sanskrit Literature	8
3	<ul style="list-style-type: none">• Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics	8

Suggested reading

1. "Abhyastakam" – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

Course Output

Students will be able to

1. Understanding basic Sanskrit language
2. Ancient Sanskrit literature about science & technology can be understood
3. Being a logical language will help to develop logic in students


JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
AUDIT 1 and 2: VALUE EDUCATION
Course Objectives

Students will be able to

1. Understand value of education and self- development
2. Imbibe good values in students
3. Let the should know about the importance of character

Syllabus

Unit	Content	Hours
1	<ul style="list-style-type: none"> • Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. • Moral and non- moral valuation. Standards and principles. • Value judgements 	4
2	<ul style="list-style-type: none"> • Importance of cultivation of values. • Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. • Honesty, Humanity. Power of faith, National Unity. • Patriotism. Love for nature ,Discipline 	6
3	<ul style="list-style-type: none"> • Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. • Punctuality, Love and Kindness. • Avoid fault Thinking. • Free from anger, Dignity of labour. • Universal brotherhood and religious tolerance. • True friendship. • Happiness Vs suffering, love for truth. • Aware of self-destructive habits. • Association and Cooperation. • Doing best for saving nature 	6
4	<ul style="list-style-type: none"> • Character and Competence –Holy books vs Blind faith. • Self-management and Good health. • Science of reincarnation. • Equality, Nonviolence ,Humility, Role of Women. • All religions and same message. • Mind your Mind, Self-control. • Honesty, Studying effectively 	6

Suggested reading

1 Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi

Course outcomes

 Students will be able to 1.Knowledge of self-development
 2.Learn the importance of Human values 3.Developing the overall personality



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

AUDIT 1 and 2: CONSTITUTION OF INDIA

Course Objectives:

Students will be able to:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. 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.
3. 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.

Syllabus

Units	Content	Hours
1	•History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working)	4
2	•Philosophy of the Indian Constitution: Preamble Salient Features	4
3	<input type="checkbox"/> Contours of Constitutional Rights & Duties: <input type="checkbox"/> Fundamental Rights <input type="checkbox"/> Right to Equality <input type="checkbox"/> Right to Freedom <input type="checkbox"/> Right against Exploitation <input type="checkbox"/> Right to Freedom of Religion <input type="checkbox"/> Cultural and Educational Rights <input type="checkbox"/> Right to Constitutional Remedies <input type="checkbox"/> Directive Principles of State Policy <input type="checkbox"/> Fundamental Duties.	4
4	<input type="checkbox"/> Organs of Governance: <input type="checkbox"/> Parliament <input type="checkbox"/> Composition <input type="checkbox"/> Qualifications and Disqualifications <input type="checkbox"/> Powers and Functions • Executive <input type="checkbox"/> President <input type="checkbox"/> Governor <input type="checkbox"/> Council of Ministers <input type="checkbox"/> Judiciary, Appointment and Transfer of Judges, Qualifications <input type="checkbox"/> Powers and Functions	4



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

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5	<input type="checkbox"/> Local Administration: <input type="checkbox"/> District's Administration head: Role and Importance, <input type="checkbox"/> Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. <input type="checkbox"/> Pachayati raj: Introduction, PRI: ZilaPachayat. <input type="checkbox"/> Elected officials and their roles, CEO ZilaPachayat: Position and role. <input type="checkbox"/> Block level: Organizational Hierarchy (Different departments), <input type="checkbox"/> Village level: Role of Elected and Appointed officials, <input type="checkbox"/> Importance of grass root democracy	O 4
6	<input type="checkbox"/> Election Commission: <input type="checkbox"/> Election Commission: Role and Functioning. <input type="checkbox"/> Chief Election Commissioner and Election Commissioners. <input type="checkbox"/> State Election Commission: Role and Functioning. <input type="checkbox"/> Institute and Bodies for the welfare of SC/ST/OBC and women.	4

Suggested reading

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Course Outcomes:

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of 1956.


JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
AUDIT 1 and 2: PEDAGOGY STUDIES
Course Objectives:

Students will be able to:

4. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
5. Identify critical evidence gaps to guide the development.

Syllabus

Units	Content	Hours
1	<input type="checkbox"/> Introduction and Methodology: <input type="checkbox"/> Aims and rationale, Policy background, Conceptual framework and terminology <input type="checkbox"/> Theories of learning, Curriculum, Teacher education. <input type="checkbox"/> Conceptual framework, Research questions. <input type="checkbox"/> Overview of methodology and Searching.	4
2	<ul style="list-style-type: none"> • Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. • Curriculum, Teacher education. 	2
3	<ul style="list-style-type: none"> • Evidence on the effectiveness of pedagogical practices • Methodology for the in depth stage: quality assessment of included studies. • How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? • Theory of change. • Strength and nature of the body of evidence for effective pedagogical practices. • Pedagogic theory and pedagogical approaches. • Teachers' attitudes and beliefs and Pedagogic strategies. 	4
4	<ul style="list-style-type: none"> • Professional development: alignment with classroom practices and follow-up support • Peer support • Support from the head teacher and the community. • Curriculum and assessment • Barriers to learning: limited resources and large class sizes 	4
5	<input type="checkbox"/> Research gaps and future directions <input type="checkbox"/> Research design <input type="checkbox"/> Contexts <input type="checkbox"/> Pedagogy <input type="checkbox"/> Teacher education <input type="checkbox"/> Curriculum and assessment <input type="checkbox"/> Dissemination and research impact.	2

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA****KAKINADA – 533 003, Andhra Pradesh, India****Suggested reading**

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272-282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

Course Outcomes:

Students will be able to understand:

1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?


JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
AUDIT 1 and 2: STRESS MANAGEMENT BY YOGA
Course Objectives

1. To achieve overall health of body and mind
2. To overcome stress

Syllabus

Unit	Content	Hours
1	<ul style="list-style-type: none"> Definitions of Eight parts of yog. (Ashtanga) 	8
2	Yam and Niyam. Do's and Don't's in life. i) Ahinsa, satya, astheya, bramhacharya and aparigraha ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan	8
3	<ul style="list-style-type: none"> Asan and Pranayam 1. Various yog poses and their benefits for mind & body 2. Regularization of breathing techniques and its effects-Types of pranayam 	8

Suggested reading

1. 'Yogic Asanas for Group Training-Part-I' : Janardan Swami YogabhyasiMandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

Course Outcomes:

Students will be able to:

1. Develop healthy mind in a healthy body thus improving social health also
2. Improve efficiency


JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
**AUDIT 1 and 2: PERSONALITY DEVELOPMENT THROUGH LIFE
ENLIGHTENMENT SKILLS**
Course Objectives

1. To learn to achieve the highest goal happily
2. To become a person with stable mind, pleasing personality and determination
3. To awaken wisdom in students

Syllabus

Unit	Content	Hours
1	Neetisatakam-Holistic development of personality <ul style="list-style-type: none"> • Verses- 19,20,21,22 (wisdom) • Verses- 29,31,32 (pride & heroism) • Verses- 26,28,63,65 (virtue) • Verses- 52,53,59 (don't's) • Verses- 71,73,75,78 (do's) 	8
2	<ul style="list-style-type: none"> • Approach to day to day work and duties. • Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48, • Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35, • Chapter 18-Verses 45, 46, 48. 	8
3	<ul style="list-style-type: none"> • Statements of basic knowledge; • Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 • Chapter 12 -Verses 13, 14, 15, 16,17, 18 • Personality of Role model. Shrimad Bhagwad Geeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, • Chapter 4-Verses 18, 38,39 • Chapter18 – Verses 37,38,63 	8

Suggested reading

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

Course Outcomes

Students will be able to

1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3. Study of Neetishatakam will help in developing versatile personality of students.