# ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES:TIRUPATI
**(AUTONOMOUS)**

## Department of Electronics & Communication Engineering
**Specialization: Digital Electronics & Communication Systems (DECS)**
**Effective for the batches admitted from 2022-23**

***M. Tech – I Semester***

| S.No | Category | Course Code | Course Title | Hours per week | | | Credits | Scheme of Examination (Max. Marks) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | CIE | SEE | Total |
| **THEORY** | | | | | | | | | | |
| 1 | PC | 22DPC3801 | Digital CommunicationTechniques | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | PC | 22DPC3802 | Advanced Digital SignalProcessing | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | PE | | **Professional Elective I** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| | | 22DPE3801 | Advanced ComputerArchitecture | | | | | | | |
| | | 22DPE3802 | Low Power VLSI Design | | | | | | | |
| | | 22DPE3803 | Audio Video Coding andCompression | | | | | | | |
| 4 | PE | | **Professional Elective II** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| | | 22DPE3804 | Transform Techniques | | | | | | | |
| | | 22DPE3805 | Data Networks | | | | | | | |
| | | 22DPE3806 | Error Control Coding | | | | | | | |
| 5 | ML | 22MBA0110 | Research Methodology and IPR | 2 | 0 | 0 | 2 | 40 | 60 | 100 |
| 6 | MC | | **Audit course I** | 2 | 0 | 0 | 0 | 40 | - | 40- |
| | | 22DMC9901 | 1. English for Research Paper Writing | | | | | | | |
| | | 22DMC2001 | 2. Disaster Management | | | | | | | |
| | | 22DMC9902 | 3. Sanskrit for Technical Knowledge | | | | | | | |
| | | 22DMC9903 | 4. Value Education | | | | | | | |
| **PRACTICAL** | | | | | | | | | | |
| 7 | PC | 22DPC3803 | Digital CommunicationTechniques Lab | 0 | 0 | 4 | 2 | 40 | 60 | 100 |
| 8 | PC | 22DPC3804 | Advanced Digital SignalProcessing Lab | 0 | 0 | 4 | 2 | 40 | 60 | 100 |
| **Total** | | | | | | | **18** | | | **740** |

# ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES:TIRUPATI
**(AUTONOMOUS)**

## Department of Electronics & Communication Engineering
**Specialization: Digital Electronics & Communication Systems (DECS)**
**Effective for the batches admitted from 2022-23**

***M. Tech – II Semester***

| S.No | Category | Course Code | Course Title | Hours per week | | | Credits | Scheme of Examination (Max. Marks) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | CIE | SEE | Total |
| **THEORY** | | | | | | | | | | |
| 1 | PC | 22DPC3805 | Pattern Recognition | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | PC | 22DPC3806 | Detection and Estimationof signals | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | PE | | **Professional Elective III** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| | | 22DPE3807 | Wireless Communicationand Networks | | | | | | | |
| | | 22DPE3808 | Microcontrollers and Programmable DigitalSignal Processors | | | | | | | |
| | | 22DPE3809 | Sensors and Actuators | | | | | | | |
| 4 | PE | | **Professional Elective IV** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| | | 22DPE3810 | Speech Processing | | | | | | | |
| | | 22DPE3811 | Network Security andCryptography | | | | | | | |
| | | 22DPE3812 | Optical CommunicationTechnology | | | | | | | |
| 5 | MC | | **Audit course II** | 2 | 0 | 0 | 0 | 40 | - | 40 |
| | | 22DMC9904 | 1.Constitution of India | | | | | | | |
| | | 22DMC5801 | 2. Pedagogy Studies | | | | | | | |
| | | 22DMC9905 | 3. Stress Management by Yoga | | | | | | | |
| | | 22DMC9906 | 4. Personality Development through Life Enlightenment Skills. | | | | | | | |
| **PRACTICAL** | | | | | | | | | | |
| 6 | PC | 22DPC3807 | Pattern Recognition Lab | 0 | 0 | 4 | 2 | 40 | 60 | 100 |
| 7 | PC | 22DPC3808 | Detection and Estimationof signals Lab | 0 | 0 | 4 | 2 | 40 | 60 | 100 |
| **PROJECT** | | | | | | | | | | |
| 8 | PR | 22DPR3801 | Technical Seminar | 0 | 0 | 4 | 2 | 100 | 00 | 100 |
| **Total** | | | | | | | **18** | | | **740** |

# ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES:TIRUPATI
**(AUTONOMOUS)**

## Department of Electronics & Communication Engineering
**Specialization: Digital Electronics & Communication Systems (DECS)**
**Effective for the batches admitted from 2022-23**

***M. Tech –III Semester***

| S.No | Category | Course Code | Course Title | Hours per week | | | Credits | Scheme of Examination (Max. Marks) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | CIE | SEE | Total |
| **THEORY** | | | | | | | | | | |
| 1 | PE | | **Professional Elective IV** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| | | 22DPE3813 | Remote Sensing | | | | | | | |
| | | 22DPE3814 | High PerformanceNetworks | | | | | | | |
| | | 22DPE3815 | MIMO Systems | | | | | | | |
| 2 | OE | | **Open Elective I** | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| | | 22DOE2001 | 1. Waste to Energy | | | | | | | |
| | | 22DOE2002 | 2. Project Management | | | | | | | |
| | | 22DOE9001 | 3. Industrial Safety | | | | | | | |
| | | 22DOE9002 | 4. Operations Research | | | | | | | |
| | | 22DOE5801 | 5. Business Analytics | | | | | | | |
| | | 22DOE9004 | 6. Composite Materials | | | | | | | |
| **PROJECT** | | | | | | | | | | |
| 3 | PR | 22DPR3802 | Dissertation Phase – I | 0 | 0 | 20 | 10 | 100 | 00 | 100 |
| 4 | PR | 22DPR3803 | Co-curricular Activities | 0 | 0 | 0 | 2 | | | |
| **TOTAL** | | | | | | | **18** | | | **300** |

***M. Tech – IV Semester***

| S.No | Category | Course Code | Course Title | Hours per week | | | Credits | Scheme of Examination (Max. Marks) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | CIE | SEE | Total |
| **PROJECT** | | | | | | | | | | |
| 1 | PR | 22DPR3804 | Dissertation Phase – II | 0 | 0 | 32 | 16 | 100 | 100 | 200 |
| **TOTAL** | | | | | | | **16** | | | **200** |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: I Semester: I Branch of Study: ECE Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DPC3801 | Digital Communication Techniques | 3 | 0 | 0 | 3 |

**Course Outcomes:** Students will be able to

CO1: Understand the concepts of Random Variables and Random Processes

CO2: Understand baseband signal concepts and different equalizers

CO3: Analyze various coherent detection schemes.

CO4: Understand receiver synchronization and properties of stationary random process.

CO5: Describe and analyze the Digital Communication systems with spread spectrum systems.

**Unit I: Review of Random Variables and Random Processes**

The random variable, Moment generating function, Markov‟s inequality, Chebyshev‟s inequality, Central limit theorem, Different distributions – Gaussian, Poisson, Chi-square, Rayleigh, Rician; Correlation–Auto-correlation, Cross correlation, Correlation matrix, Stationary processes, Wide sense stationary processes, Gaussian & Ergodic processes, Problem-solving.

**Unit II: Baseband Signal Concepts**

Baseband data transmission, the Nyquist criterion for zero ISI, Correlative level coding, Data Detection, Optimum design of transmitting and receive filters, Equalization - Linear, adaptive, fractionally spaced and decision feedback equalizers.

**Unit III: Digital Modulation Schemes**

Detection using matched filter – Optimum receivers for arbitrary binary signals and M‟ary Orthogonal signals, Analysis of coherent detection schemes for ASK, PSK, and DPSK, M‟ary signalling schemes –QPSK, QAM, MSK, Performance of the data transmission schemes under AWGN. Trellis-coded Modulation.

**Unit IV: Synchronization**

Receiver synchronization, Costas loop, symbol synchronization, synchronization with CPM – data aided and Non-aided synchronization- synchronization methods based on properties of wide sense cyclo stationary random process – Carrier recovery circuits – Symbol clock estimation schemes.

**Unit V: Spread Spectrum Systems**

PN sequences, Generation of PN sequences, DS spread spectrum systems, FH spread spectrum systems and performance of DSSS & FHSS in AWGN – Synchronization – Jamming considerations –Commercial Applications, Cellular subsystems

**Text Books:**

1. J.G.Proakis, Digital Communication (4/e), McGraw- Hill, 2001

2. Bernard Sklar, “Digital Communications – Fundamentals & Applications, ”Prentice Hall, 2001.

**References:**

1. S.Haykin, Communication Systems (4/e), Wiley,2001.

2. R.E.Zimer & R.L.Peterson: Introduction to Digital Communication, PHI, 2001.

3. G. R. Cooper & C. D. McGillem, “Modern Communications & Spread Spectrum, ”McGraw-Hill,
1986.

4. L.Hanzoetal, Turbo Coding, Turbo Equalization & Space-Time Coding Wiley

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: I Semester**: **I Branch of Study: ECE Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DPC3802 | Advanced Digital Signal Processing | 3 | 0 | 0 | 3 |

**Course Outcomes:** Students will be able to
CO1: Understand FFT Algorithms and Design and analyze Digital filters.
CO2: Acquire the basics of Multirate Digital Signal Processing.
CO3: Understand theory of prediction and solution of normal equations.
CO4: Analyze adaptive filter algorithms.
CO5: Implement power spectrum estimation techniques

**Unit I: Overview of DSP**
Overview of DSP, Characterization in time and frequency, FFT Algorithms, Digital filter design and structures: Basic FIR/IIR filter design &structures, design techniques of linear phase FIR filters, IIR filters by impulse invariance, bilinear transformation, FIR/IIR Cascaded lattice structures, and Parallel all pass realization of IIR.

**Unit II: Multirate DSP**
Multi rate DSP, Decimators and Interpolators, Sampling rate conversion, multistage decimator interpolator, poly phase filters, QMF, digital filter banks, Applications in sub band coding.

**Unit III: Linear Filters**
Linear prediction & optimum linear filters, stationary random process, forward-backward linear prediction filters, solution of normal equations, AR Lattice and ARMA Lattice-Ladder Filters, Wiener Filters for Filtering and Prediction.

**Unit VI: Adaptive Filters**
Adaptive Filters, Applications, Gradient Adaptive Lattice, Minimum mean square criterion, LMS algorithm, Recursive Least Square algorithm.

**Unit V: Power Spectrum Estimation**
Estimation of Spectra from Finite-Duration Observations of Signals. Nonparametric Methods for Power Spectrum Estimation, Parametric Methods for Power Spectrum Estimation, Minimum Variance Spectral Estimation, Eigen analysis Algorithms for Spectrum Estimation

**Text Books:**
1. J.G. Proakis and D.G. Manolakis "Digital signal processing: Principles, Algorithm and Applications", 4th Edition, Prentice Hall, 2007.
2. N. J. Fliege, "Multirate Digital Signal Processing: Multirate Systems -Filter Banks – Wavelets", 1st Edition, John Wiley and Sons Ltd, 1999.
3. Bruce W. Suter, "Multirate and Wavelet Signal Processing",1st Edition, Academic Press, 1997.

**References** :
1. M. H. Hayes, "Statistical Digital Signal Processing and Modeling", John Wiley & Sons Inc., 2002.
2. S.Haykin, "Adaptive Filter Theory", 4th Edition, Prentice Hall, 2001.
3. D.G.Manolakis, V.K. Ingle and S.M.Kogon, "Statistical and Adaptive Signal Processing", McGraw Hill, 2000.

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: I Semester: I Branch of Study: ECE Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DPE3801 | Advanced Computer Architecture | 3 | 0 | 0 | 3 |

**Course Outcomes:** Students will be able to

CO1: Understand parallel processing and pipelining concepts and applications

CO2: Understand vector processing and parallel algorithms for array processors.

CO3: Analyze the high performance scalable multiprocessor systems.

CO4: Understand multithreaded architecture and parallel programming techniques

CO5: Understand different parallel algorithms for multiprocessors

**Unit I: Parallel Processing and Pipelining Processing**

Architectural Classification, Applications of parallel processing, Instruction level Parallelism and Thread Level Parallelism, Explicitly Parallel Instruction Computing (EPIC) Architecture

**Pipeline Architecture**-Principles and implementation of Pipelining, Classification of pipelining processors, Design aspect of Arithmetic and Instruction pipelining, Pipelining hazards and resolving techniques, Data buffering techniques, Advanced pipelining techniques, Software pipelining, VLIW (Very Long Instruction Word) processor.

**Unit II: Vector and Array Processor**

Issues in Vector Processing, Vector performance modeling, SIMD Computer Organization, Static Vs Dynamic network, Parallel Algorithms for Array Processors: Matrix Multiplication.

**Unit III: Multiprocessor Architecture**

Loosely and Tightly coupled multiprocessors, Inter Processor communication network, Time shared bus, Multiport Memory Model, Memory contention and arbitration techniques, Cache coherency and bus snooping, Massively Parallel Processors (MPP).

**Unit IV:**

**Multithreaded Architecture**- Multithreaded processors, Latency hiding techniques, Principles of multithreading, Issues and solutions, Parallel Programming Techniques: Message passing program development.

**Unit V: Parallel algorithms for multiprocessors**

Classification and performance of parallel algorithms, operating systems for multiprocessors systems, Message passing libraries for parallel programming interface, PVM (in distributed memory system), Message Passing Interfaces (MPI).

**Text Books:**


1. Kai Hwang, Faye A. Briggs, "Computer Architecture and ParallelProcessing" McGraw Hill Education, 2012.
2. Kai Hwang, "Advanced Computer Architecture", McGraw Hill Education, 1993.


**References:**


1. William Stallings, "Computer Organization and Architecture, Designing for Performance "Prentice Hall, 6th edition, 2006.
2. Kai Hwang, "ScalableParallelComputing", McGraw Hill Education, 1998.
3. Harold S. Stone "High-Performance Computer Architecture", Addison-Wesley, 1993.

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: I Semester: I Branch of Study: ECE Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DPE3802 | Low Power VLSI Design | 3 | 0 | 0 | 3 |

**Course Outcomes:** Students will be able to
CO1: Identify the sources of power dissipation in digital ICs systems.
CO2: Understand different power estimation techniques.
CO3: Demonstrate circuit level techniques for reducing power.
CO4: Illustrate behavioural level and logic level approaches for low power design
CO5: Understand Low Power memory and Microprocessor designs

**Unit I: Technology & Circuit Design Levels**

Sources of power dissipation in digital ICs –Dynamic power dissipation – short circuit power dissipation, Design principles of low power design, Low Power figure of Merits - Physics of power dissipation in CMOS FET devices – Leakage components of MOSFET devices – Scaling.

**Unit II: Power Estimation**

Signal probability calculation, Probabilistic techniques for signal activity estimation, Estimation of glitching power, Power estimation at circuit level, Simulation power analysis – SPICE circuit simulation – gate level logic simulation – architecture level analysis, System level power analysis, Algorithmic level power estimation and analysis.

**Unit III: Low Power Circuit Techniques**

Circuit level techniques – Transistor and gate sizing – Network structuring and reorganization – special latches and flip-flops, Low voltage circuit design techniques - Variable-threshold (VTCMOS) approach, Multi-threshold-voltage CMOS (MTCMOS) approach, Dual-Vt assignment approach (DTCMOS) – multiple threshold CMOS based on path criticality, Adiabatic computation, pass transistor logic synthesis.

**Unit IV: Synthesis for Low Power**

Behavioural level transforms – Algorithm level transforms for low power – Architecture driven voltage scaling – power optimization using operation reduction and operation substitution – Precomputation based optimization for low power, Logic level optimization for low power, Low power arithmetic operators – Addition – Multiplication – other operations, number systems and constraints.

**Unit V: Low Power Memory Design & Low Power Microprocessor Design System**

Low Power Static RAM Architectures – Organization of Static RAM, operation of 4T SRAM Cell – 6T SRAM Cell – Banked organization of SRAM – Reducing Voltage swings on bit lines – Reducing power in write driver circuits – Reducing power in sense amplifier circuits, Software design for low power – sources of software power dissipation – software power optimizations – code sign for low power. Circuit design style - Software power estimation - co design, for low power.

**Text Books:**

1. Kaushik Roy, Sharat Prasad, “Low power CMOS VLSI circuit design”, John Wiley sons Inc.,2000.
2. Christian Piguet, “Low power CMOS circuits Technology, Logic Design and CAD tools”, CRC Press Taylor and Francis Group., 2006.
3. Gary Yeap, “Practical low power digital VLSI design”, Kluwer, 1998.

**References:**

1. J.B.Kulo and J.H Lou, “Low voltage CMOS VLSI Circuits”, Wiley, 1999.
2. A.P.Chandrasekaran and R.W.Broadersen, “Low power digital CMOS design”, Kluwer, 1995

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: I** **Semester**: **I** **Branch of Study: ECE** **Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DPE3803 | Audio Video Coding and Compression | 3 | 0 | 0 | 3 |

**Course Outcomes:** Students will be able to

CO1: Understand image lossless compression systems and coding techniques

CO2: Understand lossy compression systems and transform techniques

CO3: Understand video coding concept & motion estimation algorithm.

CO4: Analyze various video coding standards

CO5: Understand audio coding concept and multimedia synchronization

**Unit I:**

Introduction to Multimedia Systems and Processing, Lossless Image Compression Systems Image Compression Systems, Huffman Coding, Arithmetic and Lempel-Ziv Coding, Other Coding Techniques

**Unit II:**

Lossy Image Compression Systems, Theory of Quantization, Delta Modulation and DPCM, Transform Coding & K-L Transforms, Discrete Cosine Transforms, Multi-Resolution Analysis, Theory of Wavelets, Discrete Wavelet Transforms, Still Image Compression Standards: JBIG and JPEG

**Unit III:**

Video Coding and Motion Estimation: Basic Building Blocks & Temporal Redundancy, Block based motion estimation algorithms, other fast search motion estimation algorithms

**Unit IV:**

Video Coding Standards MPEG-1 standards, MPEG-2 Standard, MPEG-4 Standard, H.261, H.263 Standards, H.264 standard

**Unit V:**

Audio Coding, Basic of Audio Coding, Audio Coding, Transform and Filter banks, Polyphase filter implementation, Audio Coding, Format and encoding, Psychoacoustic Models ,Multimedia Synchronization, Basic definitions and requirements, References Model and Specification, Time stamping and pack architecture, Packet architectures and audio-video interleaving, Multimedia Synchronization, Playback continuity, Video Indexing and Retrieval: Basics of content based image retrieval, Video Content Representation, Video Sequence Query Processing

**Text Books:**

1. Iain E.G. Richardson, “H.264 and MPEG-4 Video Compression”, Wiley, 2003.

2. Khalid Sayood, “Introduction to Data Compression”, 4th Edition, Morgan Kaufmann,2012.

**References:**

1. Mohammed Ghanbari, “Standard Codes: Image Compression to Advanced Video Coding”, 3rd Edition, The Institution of Engineering and Technology, 2011.

2. Julius O. Smith III, “Spectral Audio Signal Processing”, W3K Publishing, 2011.

3. Nicolas Moreau, “Tools for Signal Compression: Applications to Speech and Audio Coding”, Wiley, 2011.

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**
**Year: I Semester: I Branch of Study: ECE Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DPE3804 | Transform Techniques | 3 | 0 | 0 | 3 |

**Course Outcomes:** Students will be able to
CO1: Understand different 1D & 2D transforms, properties and applications
CO2: Understand Short Time Fourier Transform and need for wavelets
CO3: Understand scaling functions in multiresolution analysis and wavelet generation.
CO4: Analyze multirate systems, filter banks and Discrete Wavelet Transform
CO5: Apply transform techniques to signal denoising, sub-band coding & signal compression

**Unit I: Review of Transforms**

Signal spaces, the concept of convergence Hilbert spaces for energy signals, Orthogonality, Fourier series, FT-failure of FT-need for time-frequency analysis, spectrogram plot-phase space plot in time-frequency plane, Continuous FT, DTFT, Discrete Fourier Series and Transforms, Z-Transform.

**Advance Transforms:** The relation between CFT-DTFT, DTFT-GFD,DFS-DFT, DCT(1D&2D), Walsh, Hadamard, Haar, Slant, KLT, Hilbert Transform-definition, properties, and applications.

**Unit II: CWT and MRA**

Time-frequency limitations, tiling of time-frequency plane for STFT, Heisenberg uncertainty principle, Short-Time Fourier Transform(STFT) analysis, shortcomings of STFT.

**Need for Wavelets:** Wavelet Basis –concept of scale and its relation with frequency, Continuous time Wavelet Transform Equation- Series Expansion using Wavelets- CWT.

**Unit III: Need for Scaling Function**

Multiresolution analysis, Tiling of time-Scale plane for CWT. Important Wavelets: Haar, Mexican Hat Meyer, Shannon, Daubechies.

**Special Topics:** Wavelet Packet Transform, Bi-orthogonal basis-B-splines, Lifting Scheme of Wavelet Generation-implementation.

**Unit IV: Multirate Systems, Filter Banks and DWT**

Basics of Decimation and Interpolation in time & frequency domains, Two-channel Filter bank, Perfect Reconstruction Condition, Relationship between Filter banks and Wavelet basis, DWT Filter Banks for Daubechies Wavelet Function.

**Unit V: Applications of Transforms**

Signal De-noising, Sub-band Coding of Speech and Music, Signal Compression- Use of DCT, DWT, KLT.

**Text Books:**


1. JAideva C Goswami, Andrew K Chan, “Fundamentals of wavelets-Theory, Algorithms and applications”, John Wiley & Sons, Singapore, 1999.
2. Raghuveer M.Rao and Ajit S. Bopardikar, “Wavelet Transforms-Introduction theory and applications” Pearson Edu, Asia, New Delhi,2003.
3. Soman.K.P, Ramachandran K.I, “Insight into Wavelets from Theory to Practice”, Prentice Hall India, First Edition, 2004.

**References:**


1. VetterliM.Kovacevic, “Wavelets and subband coding”, PJI, 1995.
2. C.Sydney Burrus, “Introduction to Wavelets and Wavelet Transforms”, PHI, First Edition, 1997.
3. Stephen G. Mallat, “A Wavelet Tour of Signal Processing”, Academic Press, Second Edition.
4. Jayaraman, “Digital Image Processing”, TMH, 2009.
5. S.Jayaraman, S.Esakkirajan, T.Veera Kumar, “Digital Image Processing”, TMH

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: I Semester: I Branch of Study: ECE Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DPE3805 | Data Networks | 3 | 0 | 0 | 3 |

**Course Outcomes:** Students will be able to
CO1: Know the network design concept and various network terminologies.
CO2: Understand layered & layer less Communication and switching concepts
CO3: Design Data Networks and analyze various protocols.
CO4: Understand Queuing Models of Networks and Inter Networking concepts
CO5: Understand End to End Protocols and Packet Scheduling Algorithms

**Unit I:** Network Design Issues, Network Performance Issues, Network Terminology, centralized and distributed approaches for networks design, Issues in design of voice and data networks.
**Unit II:** Layered and Layer less Communication, Cross layer design of Networks, Voice Networks (wired and wireless) and Switching, Circuit Switching and Packet Switching, Statistical Multiplexing.
**Unit III:** Data Networks and their Design, Link layer design- Link adaptation, Link Layer Protocols, Retransmission. Mechanisms(ARQ), Hybrid ARQ (HARQ), Go Back N, Selective Repeat protocols and their analysis.
**Unit IV:** Queuing Models of Networks, Traffic Models, Little's Theorem, Markov chains, M/M/1 and other Markov systems, Multiple Access Protocols, Aloha System, Carrier Sensing, Examples of Local area networks, Inter-networking, Bridging, Global Internet, IP protocol and addressing, Sub netting, Classless Inter domain Routing (CIDR), IP address lookup, Routing in Internet.
**Unit V:** End to End Protocols, TCP and UDP, Congestion Control, Additive Increase/ Multiplicative Decrease, Slow Start, Fast Retransmit/ Fast Recovery, Congestion avoidance, RED TCP Throughput Analysis, Quality of Service in Packet Networks. Network Calculus, Packet Scheduling Algorithms.

**Text Books:**


1. D. Bertsekas and R. Gallager, "Data Networks", 2nd Edition, Prentice Hall, 1992.
2. L. Peterson and B. S. Davie, "Computer Networks: A Systems Approach",5th Edition,Morgan Kaufman, 2011.
3. Kumar, D. Manjunath and J. Kuri, "Communication Networking: An analytical approach", 1st Edition, Morgan Kaufman, 2004.
4. Walrand, "Communications Network: A First Course", 2nd Edition, McGraw Hill, 2002.


**References:**


1. Leonard Kleinrock, "Queueing Systems, Volume I: Theory", 1st Edition, John Wiley and Sons, 1975.
2. Aaron Kershenbaum, "Telecommunication Network Design Algorithms", McGraw Hill,1993.
3. Vijay Ahuja, "Design and Analysis of Computer Communication Networks", McGrawHill, 1987

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: I Semester: I Branch of Study: ECE Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DPE3806 | Error Control Coding | 3 | 0 | 0 | 3 |

**Course Outcomes**: Students will be able to
CO1: Understand coding concepts for reliable digital transmission and storage
CO2: Understands concepts involved in formulation and computation of linear block codes.
CO3: Understands concepts involved in generation of cyclic codes and binary BCH codes.
CO4: Get knowledge regarding block codes and relevant algorithms
CO5: Get knowledge regarding convolutional codes and relevant algorithms

**Unit I: Introduction to Coding**

Introduction: Coding for Reliable Digital Transmission and Storage – Types of codes, Modulation and coding, Maximum likelihood decoding, Types of errors, Error control strategies, performance measures, Coded modulation, Introduction to Algebra - Groups & fields, Binary field arithmetic, Construction of Galois field and its basic properties, Computations, Vector spaces, matrices, problem solving.

**Unit II: Linear Block Codes**

Introduction linear block codes, Syndrome and Error Detection, Error Detection and Error correction capabilities of a Block Code, Standard array and syndrome decoding, Probability of an undetected error for linear codes over a BSC, Single parity check codes, repetition codes, and self-dual codes, Hamming codes, A class of single error correcting and double error detecting codes, Reed-Muller codes and other constructions, The squaring construction of codes, The Golay code, Interleaved Codes, Illustrative-problems.

**Unit III: Cyclic and Binary BCH Codes**

Description of Cyclic codes, Generator and parity – check matrices of cyclic codes, Encoding of Cyclic codes, Syndrome computation and error detection, Decoding of Cyclic Codes, Cyclic Hamming codes, The Golay code, Shortened Cyclic codes, Cyclic product codes, Binary primitive BCH codes, Decoding of BCH codes, Iterative algorithm for finding the error location polynomial & its iterative algorithm, Finding the error location numbers and error correction, Correction of errors and erasures, Implementation of Galois Field arithmetic, Implementation of error correction, Weighted distribution & Error detection of binary BCH codes, Illustrative Problems.

**Unit IV: Block Codes**

q-ary Linear block codes, Primitive BCH codes, Reed-Solomon codes, Decoding of Non-binary BCH and RS codes, Decoding with the Euclidean algorithm, Frequency domain decoding, Correction of errors and erasures, One Step majority logic decoding and its variations, Multiple step majority logic decoding, Euclidean Geometry (EG) and its codes, Twofold EG codes, Projective geometry and projective geometry codes, Illustrative problems

**Unit V: Convolution Codes**

Encoding of Convolution codes, Structural properties and distance properties of Convolutional codes, The Viterbi Algorithm, Performance Bounds for Convolutional Codes, Construction of good Convolutional codes, Implementation and performance of the Viterbi algorithm, The soft output of Viterbi algorithm (SOVA).

The BCJR algorithm, Punctured and Tail-biting Convolutional codes, ZJ sequential decoding algorithm, The Fano Sequential Decoding algorithm, Performance characteristics and code construction of Sequential decoding, Majority Logic decoding and its performance characteristics, Code construction of Majority logic decoding, Illustrative problems.

**Text Books:**


1. Shu Lin, Daniel J. Costello, Jr., “Error Control Coding,” Pearson Publications, Second Edition,2011.
2. Bernard Sklar, Pabitra Kumar Ray, “Digital Communications Fundamentals and Applications,”Pearson Publications, Second Edition, 2009.


**References:**


1.Blahut. R. E, "Theory and practice of error control codes", Addison-Wesley, 1984

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: I Semester: I Branch of Study: ECE Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22MBA0110 | Research Methodology and IPR | 2 | 0 | 0 | 2 |

**Course Outcomes:**
CO1: To acquaint with basics of research problem formulation
CO2: Familiar with research related information and ethics.
CO3: aware about research report writing and presentation.
CO4: Understand and get knowledge of basic rights for protection of innovatives.
CO5: Understand different types of IPRs

**Unit 1: Introduction to Research** – Types of Research, 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 to investigation of solutions for research Problem.

**Unit 2: Review of Literature and Data Collection** - Effective literature studies approaches, analysis, Plagiarism and Research ethics. Data collection, analysis, interpretation, Necessary instrumentations.

**Unit 3: Report Writing** - 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: Intellectual Property Rights**: Nature, Patents, Designs, Trade 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.**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:**


1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
3. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
4. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
5. Mayall, "Industrial Design", McGraw Hill, 1992.
6. Niebel, "Product Design", McGraw Hill, 1974.
7. Asimov, "Introduction to Design", Prentice Hall, 1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in NewTechnological Age", 2016.
9. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: I** **Semester**: **I** **Branch of Study: ECE** **Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DMC9901 | English for Research Paper Writing | 2 | 0 | 0 | 0 |

**Course Outcomes:** At the end of the course, students will be able to
**1.** Understand that how to improve your writing skills and level of readability
**2.** Learn about what to write in each section
**3.** Understand the skills needed when writing a Title
**4.** Develop writing skill
**5.** Able to quote phrases

**UNIT – I:**
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

**UNIT – II:**
Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

**UNIT – III:**
Review of the Literature, Methods, Results, Discussion, Conclusions, the Final Check. 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,

**UNIT – IV:**
Skill 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

**UNIT -V:**
Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

**REFERENCES:**

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

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: I Semester: I Branch of Study: ECE Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DMC2001 | Disaster Management | 2 | 0 | 0 | 0 |

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

1. Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. 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

**UNIT – I:**

Introduction

Disaster: Definition, Factors and Significance; Difference between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude. 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.

**UNIT – II:**

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

**UNIT – III:**

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.

**UNIT – IV:**

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.

**UNIT -V:**

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.

**REFERENCES:**

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies" New Royal book Company.

2. Sahni, Pardeep et.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.

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: I** **Semester**: **I** **Branch of Study: ECE** **Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DMC9902 | Sanskrit for Technical Knowledge | 2 | 0 | 0 | 0 |

**Course Outcomes:** At the end of the course, students will be able to
1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
2. Learning of Sanskrit to improve brain functioning
3. Understanding basic Sanskrit language
4. Ancient Sanskrit literature about science & technology can be understood
5. Being a logical language will help to develop logic in students

**UNIT – I:**
Alphabets in Sanskrit, Past/Present/Future Tense,

**UNIT – II:**
Simple Sentences

**UNIT – III:**
Order, Introduction of roots

**UNIT – IV:**
Technical information about Sanskrit Literature

**UNIT -V:**
Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

**REFERENCES:**

1. "Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi

2. "Teach Yourself Sanskrit" Prathama Deeksha-VempatiKutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication

3. "India‟s Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: I** **Semester**: **I** **Branch of Study: ECE** **Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DMC9903 | Value Education | 2 | 0 | 0 | 0 |

**Course Outcomes:** At the end of the course, 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
4. Learn the importance of Human values
5. Developing the overall personality

**UNIT – I:**
Values and self-development –Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non- moral valuation, Standards and principles, Value judgments

**UNIT – II:**
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

**UNIT – III:**
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, Order, Introduction of roots

**UNIT – IV:**
Happiness Vs suffering, love for truth, Aware of self-destructive habits, Association and Cooperation, Doing best for saving nature

**UNIT -V:**
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

REFERENCES:

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

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: I** **Semester**: **I** **Branch of Study: ECE** **Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DPC3803 | Digital Communication Techniques Lab | 0 | 0 | 4 | 2 |

**Course Outcomes**: Students will be able to
CO1: Design Encoder and Decoder for single bit error correction.
CO2: Simulate and Analyze Digital Signals.
CO3: Generate and Detect Pass band modulation signals with Error controlling codes.
CO4: Analyze Performance of M-ary Digital Communication Techniques.
CO5: Analyze the error performance of Gaussian, Rician, and Rayleigh channels.

**List of Experiments:**

1. Generation of Pulse Modulated signals: PAM, PWM and PPM
2. Time division Multiplexing
3. Generation of (7, 4) Hamming code and Error detection in different channels.
4. Generation and detection of ASK, FSK and PSK signals
5. Generation and detection of DPSK Signals
6. Generation and detection of QPSK Signals
7. Generation and detection of QAM signals
8. Generation and detection of M-ary ASK, FSK and PSK signals
9. Generation and detection of MSK signal
10. Experimentally compare different forms of BPSK and QPSK and analyze their spectrum with spectrum analyzer.
11. Generation and Detection of ASK, FSK and PSK with (7, 4) hamming code
12. Generation of turbo code.
13. Obtain Gaussian, Rician PDF and CDF with PSK modulation.
14. Obtain Rayleigh PDF and CDF with PSK modulation.

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: I Semester**: **I Branch of Study: ECE Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DPC3804 | Advanced Digital Signal Processing Lab | 0 | 0 | 4 | 2 |

**Course Outcomes**: Students will be able to
CO 1: Design different digital filters in software.
CO 2: Apply various transforms in time and frequency.
CO 3: Perform decimation and interpolation.
CO 4: Able to realize different filters.
CO 5: Perform convolution and correlation**.**

**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

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: I Semester: II Branch of Study: ECE Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DPC3805 | Pattern Recognition | 3 | 0 | 0 | 3 |

**Course Outcomes**: Students will be able to
CO1: Understand the principles of Bayesian parameter estimation and apply them in relatively simple probabilistic models
CO2: Understand various linear models.
CO3: Understand Neural Network concepts related to pattern recognition.
CO4: Apply and analyze various linear discriminant algorithms.
CO5: Apply and develop machine independent and unsupervised learning techniques.

**Unit I: Introduction to Pattern Recognition**
Problems, applications, design cycle, learning and adaptation, examples, Probability Distributions, Parametric Learning - Maximum likelihood and Bayesian Decision Theory - Bayes rule, discriminant functions, loss functions and Bayesian error analysis.

**Unit II : Linear Models**
Linear Models for Regression, linear regression, logistic regression Linear Models for Classification

**Unit III: Neural Network**
Perceptron, multi-layer perceptron, backpropagation algorithm, error surfaces, practical techniques for improving backpropagation, additional networks and training methods, Adaboost, Deep Learning

**Unit IV: Linear Discriminant Functions**
Linear discriminant functions : Decision surfaces, two-category, multi-category, minimum squared error procedures, the Ho-Kashyap procedures, linear programming algorithms, Support vector machine.

**Unit V: Algorithm independent machine learning**
Algorithm independent machine learning – lack of inherent superiority of any classifier, bias and variance, re-sampling for classifier design, combining classifiers
Unsupervised learning and clustering – k-means clustering, fuzzy k-means clustering, hierarchical clustering.

**Text Books:**
1.Richard O. Duda, Peter E. Hart, David G. Stork, "Pattern Classification", 2nd Edition John Wiley & Sons, 2001.
2. Trevor Hastie, Robert Tibshirani, Jerome H. Friedman, "The Elements of Statistical Learning", 2nd Edition, Springer, 2009.
3. C. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.

**Reference Books:**
1. S.Haykin, Communication Systems (4/e), Wiley,2001.
2. R.E.Zimer&R.L.Peterson: Introduction to Digital Communication, PHI, 2001.
3. G. R. Cooper & C. D. McGillem, "Modern Communications & Spread Spectrum, "McGraw-Hill, 1986.
4. L.Hanzoetal, Turbo Coding, Turbo Equalization & Space-Time Coding Wiley

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: I** **Semester**: **II** **Branch of Study: ECE** **Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DPC3806 | Detection and Estimation of Signals | 3 | 0 | 0 | 3 |

**Course Outcomes**: Students will be able to
CO1: Understand the basic concepts of signal detection and estimation.
CO2: Understand different hypotheses in detection and estimation problems.
CO3: Understand the concepts of Stochastic Processes.
CO4: Understand the conceptual basics of detection theory.
CO5: Derive and apply filtering methods for parameter estimation.

**Unit I: Review of Vector Spaces**
Vectors and matrices: notation and properties, orthogonality and linear independence, bases, distance properties, matrix operations, Eigen values and eigenvectors.

**Unit II: Properties Of Symmetric Matrices**
Properties of Symmetric Matrices: Diagonalization of symmetric matrices, symmetric positive definite and semi definite matrices, principal component analysis (PCA), singular value decomposition.

**Unit III: Stochastic Processes**
Stochastic Processes: Time average and moments, ergodicity, power spectral density, covariance matrices, response of LTI system to random process, cyclostationary process, and spectral factorization.

**Unit IV: Detection Theory**
Detection Theory: Detection in white Gaussian noise, correlator and matched filter interpretation, Bayes,, criterion of signal detection, MAP, LMS, entropy detectors, detection in colored Gaussian noise, Karhunen-Loeve expansions and whitening filters.

**Unit V: Estimation Theory**
Estimation Theory: Minimum variance estimators, Cramer-Rao lower bound, examples of linear models, system identification, Markov classification, clustering algorithms. Topics in Kalman and Weiner Filtering: Discrete time Wiener-Hopf equation, error variance computation, causal discrete time Wiener filter, discrete Kalman filter, extended Kalman filter, examples. Specialized Topics in Estimation: Spectral estimation methods like MUSIC, ESPIRIT, DOA Estimation.

**Text Books:**
1. Steven M. Kay, "Fundamentals of Statistical Signal Processing, Volume I: Estimation Theory", Prentice Hall, 1993
2. Steven M. Kay, "Fundamentals of Statistical Signal Processing, Volume II: Detection Theory", 1st Edition, Prentice Hall, 1998.

**Reference Books:**
1. Thomas Kailath, Babak Hassibi, Ali H. Sayed, "Linear Estimation", Prentice Hall, 2000.
2. H. Vincent Poor, "An Introduction to Signal Detection and Estimation", 2nd Edition, Springer, 1998

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: I Semester**: **II Branch of Study: ECE Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DPE3807 | Wireless Communication and Networks | 3 | 0 | 0 | 3 |

**Course Outcomes**: Students will be able to
CO1: Understand the Cellular Concepts related to wireless communication systems
CO2: Know about the mobile radio propagation related to large scale path loss.
CO3: Know about the mobile radio propagation related to Small – Scale Fading and Multipath.
CO4: Understand the concepts of Equalization and various diversities of wireless communication.
CO5: Understand the different protocols used for wireless communication systems and networks.

**Unit I: The Cellular Concept**

The Cellular Concept - System Design Fundamentals: Introduction, Frequency Reuse, channel Assignment Strategies, Handoff Strategies- Prioritizing and offs, Practical Handoff Considerations, interference and system capacity – Co-channel Interference and system capacity, Channel Planning for wireless Systems, Adjacent Channel Interference , Power Control for educing interference, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring.

**Unit II: Mobile Radio Propagation**

Large-Scale Path Loss: Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, The Three 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-LongleyRyce 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 modelling.

**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, Nonlinear 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 Techniques-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 – Gottapu Sasibhushana Rao, Pearson Education, 2012.

**Reference Books:**

1. Principles of Wireless Networks – KavehPahLaven and P. Krishna Murthy, 2002, PE
2. Wireless Digital Communications – Kamilo Feher, 1999, PHI.
3. Wireless Communication and Networking – William Stallings, 2003, PHI

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: I** **Semester**: **II** **Branch of Study: ECE** **Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DPE3808 | Microcontrollers and Programmable Digital Signal Processors | 3 | 0 | 0 | 3 |

**Course Outcomes**: Students will be able to
CO1: Understand ARM Cortex – M3 Processor architecture and other features.
CO2: Understand LPC 17XX Microcontroller various Input and output peripherals
CO3: Understand the concepts of Programmable DSP Processors architecture and its features..
CO4: Understand the TMS320C6000 series processor architecture and instructions.
CO5: Able to Develop small applications by utilizing the ARM processor core and DSP processor-based platform using Code Composer Studio

**Unit I: ARM Cortex-M3 Processor**

Applications, Programming model – Registers, Operation modes, Exceptions and Interrupts, Reset Sequence Instruction Set, Unified Assembler Language, Memory Maps, Memory Access Attributes, Permissions, Bit-Band Operations, Unaligned and Exclusive Transfers. Pipeline, Bus Interfaces.

**Unit II: LPC 17xx Microcontroller**

Internal memory, GPIOs, Timers, ADC, UART and other serial interfaces, PWM, RTC, WDT.

**Unit III: Programmable DSP (P-DSP) Processors**

Harvard architecture, Multi port memory, architectural structure of P-DSP- MAC unit, Barrel shifters, Introduction to TI DSP processor family.

**Unit IV: Architecture and TMS320C6000 Series**

Architecture study, data paths, cross paths, Introduction to Instruction level architecture of C6000 family, Assembly Instructions memory addressing, for arithmetic, logical operations.

**Unit V: Code Composer Studio**

CCS for application development for digital signal processing, On chip peripherals, Processor benchmarking.

**Text Books:**

1. Joseph Yiu, “The definitive guide to ARM Cortex-M3”, Elsevier, 2nd Edition
2. Venkatramani B. and Bhaskar M. “Digital Signal Processors: Architecture, Programming and Applications” , TMH , 2nd Edition.
3. Sloss Andrew N, Symes Dominic, Wright Chris, “ARM System Developer's Guide: Designing and Optimizing”, Morgan Kaufman Publication.

**Reference Books:**

1. Steve furber, “ARM System-on-Chip Architecture”, Pearson Education.
2. Frank Vahid and Tony Givargis, “Embedded System Design”, Wiley.
3. Technical references and user manuals on www.arm.com, NXP Semiconductor www.nxp.com and Texas Instruments www.ti.com

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: I** **Semester**: **II** **Branch of Study: ECE** **Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DPE3809 | Sensors and Actuators | 3 | 0 | 0 | 3 |

**Course Outcomes**: Students will be able to

CO1: Understand some basic principles and techniques of micro sensors and actuators.
CO 2: Understand basic laws and phenomena on which operation of sensors and actuators transformation of energy.
CO 3: Knowledge about of the working principles and architecture of a large number of sensors and their elements.
CO 4: Choose and use sensors and equipment for measuring mechanical quantities and temperature.
CO 5: knowledge about the architecture and working principles of the most common electrical motor types.

**Unit I: Sensors / Transducers**

Principles – Classification – Parameters – Characteristics - Environmental Parameters (EP) – Characterization Mechanical and Electromechanical Sensors: Introduction – Resistive Potentiometer –Strain Gauge – Resistance Strain Gauge – Semiconductor Strain Gauges - Inductive Sensors: Sensitivity and Linearity of the Sensor –Types - Capacitive Sensors– Electrostatic Transducer– Force/Stress Sensors Using Quartz Resonators – Ultrasonic Sensors.

**Unit 2: Thermal Sensors**

Thermal Sensors - Introduction – Gas thermometric Sensors – Thermal Expansion Type Thermometric Sensors – Acoustic Temperature Sensor – Dielectric Constant and Refractive Index thermo sensors – Helium Low Temperature Thermometer – Nuclear Thermometer – Magnetic Thermometer – Resistance Change Type Thermometric Sensors –Thermo EMF Sensors– Junction Semiconductor Types– Thermal Radiation Sensors –Quartz Crystal Thermoelectric Sensors – NQR Thermometry – Spectroscopic Thermometry –Noise Thermometry – Heat Flux Sensors Magnetic sensors: Introduction – Sensors and the Principles Behind – Magneto resistive Sensors – Anisotropic Magneto resistive Sensing – Semiconductor Magneto resistors– Hall Effect and Sensors – Inductance and Eddy Current Sensors– Angular/ Rotary Movement Transducers – Synchros – Synchro-resolvers - Eddy Current Sensors – Electromagnetic Flow meter – Switching Magnetic Sensors SQUID Sensors.

**UNIT 3: Radiation Sensors**

Introduction – Basic Characteristics – Types of Photo sensors / Photo detectors– X-ray and Nuclear Radiation Sensors – Fiber Optic Sensors Electro analytical Sensors: Introduction – The Electrochemical Cell – The Cell Potential - Standard Hydrogen Electrode (SHE) –

Liquid Junction and Other Potentials –Polarization – Concentration Polarization-– Reference Electrodes - Sensor Electrodes – Electro ceramics in gas media.

**UNIT 4: Smart Sensors**

Smart Sensors: Introduction – Primary Sensors – Excitation – Amplification – Filters – Converters – Compensation–Information Coding/Processing - Data Communication – Standards for Smart Sensor Interface – The Automation Sensors –Applications: Introduction – On-board Automobile Sensors (Automotive Sensors)–Home Appliance Sensors – Aerospace Sensors — Sensors for Manufacturing –Sensors for Environmental Monitoring.

**UNIT 5: Actuators**

Actuators: Pneumatic and Hydraulic Actuation Systems- Actuation systems – Pneumatic and hydraulic systems -Directional Control Valves – Pressure control valves – Cylinders - Servo and proportional control valves– Process control valves – Rotary actuators Mechanical Actuation Systems- Types of motion – Kinematic chains – Cams – Gears – Ratchet and pawl Belt and chain drives – Bearings – Mechanical aspects of motor selection Electrical Actuation Systems-Electrical systems - Mechanical switches – Solid-states witches Solenoids D.C. Motors – A.C. motors – Stepper motors.

**Text Books**

1. D. Patranabis – "Sensors and Transducers" –PHI Learning Private Limited.
2. W. Bolton – "Mechatronics" –Pearson Education Limited.

**Reference Books:**

1. Sensors and Actuators – D. Patranabis – 2nd Ed., PHI, 2013

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: I Semester: II Branch of Study: ECE Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DPE3810 | Speech Processing | 3 | 0 | 0 | 3 |

**Course Outcomes**: Students will be able to

CO1. Express the speech signal in terms of its time domain and frequency domain representations and the different ways in which it can be modelled;

CO2. Derive expressions for simple features used in speech classification applications;

CO3. Explain the operation of example algorithms covered in lectures, and discuss the effects of varying parameter values within these;

CO4. Synthesise block diagrams for speech applications, explain the purpose of the various blocks, and describe in detail algorithms that could be used to implement them;

CO5. Implement components of speech processing systems, including speech recognition and speaker recognition, in MATLAB.

**Unit I:**

**FUNDAMENTALS OF DIGITAL SPEECH PROCESSING:** Anatomy & Physiology of Speech organs, the process of speech production, the acoustic theory of speech production, Digital models for speech signals.

**TIME DOMAIN MODELS FOR SPEECH PROCESSING:** Introduction- Window considerations, Short time energy and average magnitude Short time average zero crossing rate, Speech vs silence discrimination using Average energy and zero crossing, Pitch period estimation using parallel processing approach, The short-time autocorrelation function, The short time average magnitude difference function, Pitch period estimation using the autocorrelation function.

**Unit II:**

**LINEAR PREDICTIVE CODING (LPC) ANALYSIS:** Basic Principles of Linear Predictive Analysis: The Autocorrelation Method, The Covariance Method, Solution of LPC Equations: Cholesky Decomposition, Solution for Covariance Method, Durbin's Recursive Solution for the Autocorrelation Equations, Comparison between the Methods of Solution of the LPC Analysis Equations, Applications of LPC Parameters: Pitch Detection using LPC Parameters, Formant Analysis using LPC Parameters.

**Unit III:**

**HOMOMORPHIC SPEECH PROCESSING:** Introduction, Homomorphic Systems for Convolution: Properties of the Complex Cepstrum, Computational Considerations, the Complex Cepstrum of Speech, Pitch Detection, Formant Estimation, and the Homomorphic Vocoder.

**SPEECH ENHANCEMENT:** Nature of interfering sounds, Speech enhancement techniques, Spectral subtraction, Enhancement by re-synthesis.

**Unit IV:**

**AUTOMATIC SPEECH RECOGNITION:** Basic pattern recognition approaches, parametric representation of speech, evaluating the similarity of speech patterns, Isolated Digit Recognition System, Continuous Digit Recognition System

**SPEAKER RECOGNITION:** Recognition techniques, Features that distinguish speakers, Speaker Recognition Systems: Speaker Verification System, Speaker Identification System.

**Unit V:**

**HIDDEN MARKOV MODEL (HMM) FOR SPEECH:** Hidden Markov model (HMM) for speech recognition, Viterbi algorithm, Training and testing using HMMS, Adapting to variability in speech, Language models.

## Text Books


1. L.R Rabiner and S.W.Schafer, "Digital processing of speech signals", Pearson.
2. Douglas O Shaughnessy, "Speech Communication", Second Edition Oxford University Press, 2000.
3. L.R Rabiner and B.H.Juang, "Fundamentals of Speech Recognition"


## Reference Books


1. Thomas F. Qatari, "Discrete-Time Speech Signal Processing", 1/e, Pearson
2. Ben Gold & Nelson Morgan, "Speech & Audio Signal Processing", 1/e, Wiley

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: I** **Semester**: **II** **Branch of Study: ECE** **Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DPE3811 | Network Security and Cryptography | 3 | 0 | 0 | 3 |

**Course Outcomes**: Students will be able to

CO1: Understand need for Network Security and various techniques related to security.
CO2: Understand the concepts of number theory and private-key cryptography.
CO3: Understand the concept of Public key cryptography.
CO4: Understand various protocols for message authentication.
CO5: Understand various issues of network security.

**Unit I: Security**

Security-Need, security services, Attacks, OSI Security Architecture, one-time passwords, Model for Network security, Classical Encryption Techniques like substitution ciphers, Transposition ciphers, Cryptanalysis of Classical Encryption Techniques.

**Unit II: Number Theory**

Introduction, Fermat"s and Euler"s Theorem, The Chinese Remainder Theorem, Euclidean Algorithm, Extended Euclidean Algorithm, and Modular Arithmetic.

**Private-Key (Symmetric) Cryptography** - Block Ciphers, Stream Ciphers, RC4 Stream cipher, Data Encryption Standard (DES), Advanced Encryption Standard (AES), Triple DES, RC5, IDEA, Linear and Differential Cryptanalysis.

**Unit III: Public-Key (Asymmetric) Cryptography**

RSA, Key Distribution and Management, Diffie-Hellman Key Exchange, Elliptic Curve Cryptography, Message Authentication Code, hash functions, message digest algorithms: MD4 MD5, Secure Hash algorithm, RIPEMD-160, HMAC.

**Unit IV: Authentication**

IP and Web Security Digital Signatures, Digital Signature Standards, Authentication Protocols, Kerberos, IP security Architecture, Encapsulating Security Payload, Key Management, Web Security Considerations, Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction.

**Unit V: System Security**

Intruders, Intrusion Detection, Password Management, Worms, viruses, Trojans, Virus Countermeasures, Firewalls, Firewall Design Principles, Trusted System

**Text Books**

**1.** William Stallings, "Cryptography and Network Security, Principles and Practices", Pearson Education, 3rd Edition.
**2.** Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security, Private Communication in a Public World", Prentice Hall, 2nd Edition

**Reference Books**

1. Christopher M. King, Ertem Osmanoglu, Curtis Dalton, "Security Architecture, Design Deployment and Operations", RSA Pres,
2. Stephen Northcutt, LenyZeltser, Scott Winters, Karen Kent, and Ronald W. Ritchey, " Inside Network Perimeter Security", Pearson Education, 2nd Edition.
3. Richard Bejtlich, "The Practice of Network Security Monitoring: Understanding Incident Detection and Response", William Pollock Publisher, 2013.

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: I Semester**: **II Branch of Study: ECE Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DPE3812 | Optical Communication Technology | 3 | 0 | 0 | 3 |

**Course Outcomes**: Students will be able to

CO1: Understand the concepts signal propagation in optical fibers.
CO2: Understand fiber optic components for communication and networking.
CO3: Understand the concepts modulation and demodulation of optical signal.
CO4: Understand the concepts transmission system engineering.
CO5: Understand the concepts of Fiber Nonlinearities and System Design Considerations.

**Unit I: Signal Propagation in Optical Fibers**

Geometrical Optics approach and Wave Theory approach, Loss and Bandwidth, Chromatic Dispersion, Non-Linear Effects- Stimulated Brillouin and Stimulated Raman Scattering, Propagation in a Non-Linear Medium, Self-Phase Modulation, and Cross-Phase Modulation, Four Wave Mixing, Principle of Solitons.

**Unit II: Fiber Optic Components for Communication & Networking**

Couplers, Isolators and Circulators, Multiplexers, Bragg Gratings, Fabry-Perot Filters, Mach Zender Interferometers, Arrayed Waveguide Grating, Tunable Filters, High Channel Count Multiplexer Architectures, Optical Amplifiers, Direct and External Modulation Transmitters, Pump Sources for Amplifiers, Optical Switches and Wavelength Converters.

**Unit III: Modulation and Demodulation of Optical Signal**

Signal formats for Modulation, Subcarrier Modulation, and Multiplexing, Optical Modulations – Duo binary, Single Side Band and Multilevel Schemes, Ideal and Practical receivers for Demodulation, Bit Error Rates, Timing Recovery and Equalization, Reed-Solomon Codes for Error Detection, and Correction.

**Unit IV: Transmission System Engineering**

System Model, Power Penalty in Transmitter and Receiver, Optical Amplifiers, Crosstalk and Reduction of Crosstalk, Cascaded Filters, Dispersion Limitations, and Compensation Techniques

**Unit V: Fiber Nonlinearities and System Design Considerations**

Limitation in High Speed and WDM Systems due to Non-linearities in Fibers, Wavelength Stabilization against Temperature Variations, Overall System Design considerations – Fiber Dispersion, Modulation, Non-Linear Effects, Wavelengths, All-Optical Networks.

**Text Books**


1. Optical Networks: A Practical Perspective - Rajiv Ramaswami and KumarN.
2. Sivarajan, 2nd Ed., 2004, Elsevier Morgan Kaufmann Publishers (An Imprint of Elsevier). Optical Fiber Communications – Gerd Keiser, 3rd Ed., 2000,McGraw-Hill.
3. Optical Fiber Communications: Principles and Practice – John.M.Senior, 2nd Ed., 2000,PE.
4. Fiber Optics Communication – Harold Kolimbris, 2nd Ed., 2004,PEI


**Reference**


1. Optical Networks: Third Generation Transport Systems – Uyless Black, 2nd Ed., 2009,PEI
2. Optical Fiber Communications – Govind Agarwal, 2nd Ed., 2004,TMH.
3. Optical Fiber Communications and Its Applications – S.C.Gupta, 2004,PHI.

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: I Semester: II Branch of Study: ECE Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DMC9904 | Constitution of India | 2 | 0 | 0 | 0 |

**Course Outcomes:** At the end of the course, students will be able to
CO1: Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
CO2: Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
CO3: 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.
CO4: Discuss the passage of the Hindu Code Bill of 1956.
CO5: Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.

**UNIT – I:**
History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working), Philosophy of the Indian Constitution: Preamble Salient Features

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

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

**UNIT – IV:**
Local Administration: District‟s Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayat raj: Introduction, PRI: Zilla Pachayat, Elected officials and their roles, CEO Zilla Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

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

**REFERENCES:**

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.

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: I Semester: II Branch of Study: ECE Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DMC5801 | Pedagogy Studies | 2 | 0 | 0 | 0 |

**Course Outcomes:** At the end of the course, students will be able to
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? Perspective.
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.

**UNIT – I:**
Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions, Overview of methodology and Searching.

**UNIT – II:**
Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

**UNIT – III:**
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.

**UNIT – IV:**
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

**UNIT -V:**
Research gaps and future directions, Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

**REFERENCES:**

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.

`

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: I** **Semester**: **II** **Branch of Study: ECE** **Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DMC9905 | Stress Management by Yoga | 2 | 0 | 0 | 0 |

**Course Outcomes:** At the end of the course, students will be able to
CO1: Develop healthy mind in a healthy body thus improving social health also
CO2: Improve efficiency
CO3: To achieve overall health of body and mind
CO4: To overcome stress
CO5:Identify critical evidence gaps to guide the development.

**UNIT – I:**
Definitions of Eight parts of yoga ( Ashtanga )

**UNIT – II:**
Yam and Niyam. Ahinsa, satya, astheya, bramhacharya and aparigraha

**UNIT – III:**
Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

**UNIT – IV:**
Asan and Pranayam: Various yoga poses and their benefits for mind & body

**UNIT -V:**
Regularization of breathing techniques and its effects-Types of pranayam

**REFERENCES:**

1. „Yogic Asanas for Group Tarining-Part-I" :Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama (Publication Department), Kolkata

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: I Semester: II Branch of Study: ECE Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DMC9906 | Personality Development through Life Enlightenment Skills | 2 | 0 | 0 | 0 |

**Course Outcomes:** At the end of the course, students will be able to
CO1: Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality andb achieve the highest goal in life
CO2: The person who has studied Geeta will lead the nation and mankind to peace and prosperity
CO3: Study of Neetishatakam will help in developing versatile personality of students.
CO4: To become a person with stable mind, pleasing personality and determination
CO5: To awaken wisdom in students

**UNIT – I:**
Neetisatakam-Holistic development of personality
1. Verses- 19,20,21,22 (wisdom)
2. Verses- 29,31,32 (pride & heroism)
3. Verses- 26,28,63,65 (virtue)
4. Verses- 52,53,59 (dont‟s)
5. Verses- 71,73,75,78 (do‟s)

**UNIT – II:**
1. Approach to day to day work and duties.
2. Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48,

**UNIT – III:**
1. Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
2. Chapter 18-Verses 45, 46, 48.

**UNIT – IV:**
1. Statements of basic knowledge.
2. Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68
3. Chapter 12 -Verses 13, 14, 15, 16,17, 18

**UNIT -V:**
1. Personality of Role model.
2. Shrimad Bhagwad Geeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
3. Chapter 4-Verses 18, 38,39
4. Chapter18 – Verses 37,38,63

**REFERENCES:**

1. “Srimad Bhagavad Gita” by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata
2. Bhartrihari‟s Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES:: TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: I Semester: II Branch of Study: ECE Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DPC3807 | Pattern Recognition Lab | 0 | 0 | 4 | 2 |

**Course Outcomes**: Students will be able to

CO1: Develop and Design Machine Learning solutions to classification, regression and clustering problems.
CO2: Evaluate and interpret the results of various algorithms.

**List of Experiments**

1. Implement Maximum Likelihood algorithm
2. Implement Bayes classifier
3. Implement Linear regression
4. Design a classifier using perceptron rule
5. Design a classifier using feed forward back-propagation and delta rule algorithms
6. Implement deep learning algorithm
7. Implement linear discriminant algorithm
8. Design a two class classifier using SVM
9. Design a multiclass classifier using SVM
10. Perform unsupervised learning.

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES:: TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: I Semester: II Branch of Study: ECE Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DPC3808 | Detection and Estimation of signals Lab | 0 | 0 | 4 | 2 |

**Course Outcomes: Student will be able to**

CO1: Simulate Signals and Noise

CO 2: Detect signals in the presence of noise

CO 3: Compare various estimation techniques

**List of Experiments**

1. Simulate signal and noise models models.
2. Simulate spatially separated target Signal in the presence of Additive Correlated White Noise
3. Simulate spatially separated target Signal in the presence of Additive Uncorrelated White Noise
4. Simulate spatially separated target Signal in the presence of Additive Correlated Colored Noise
5. Detect Constant amplitude Signal in AWGN
6. Detect Time varying Known Signals in AWGN
7. Detect Unknown Signals in AWGN
8. Compare performance comparison of the Estimation techniques - MLE, MMSE, and Bayes Estimator
9. Compare performance comparison of the Estimation techniques MAP Estimator, Expectation Maximization (EM) algorithm
10. Performance comparison of conventional Energy Detectors and Coherent Matched Filter Techniques

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES:: TIRUPATI (AUTONOMOUS)**

**AK22 Regulations**

**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: II Semester: III Branch of Study: ECE Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DPE3813 | Remote Sensing | 3 | 0 | 0 | 3 |

**Course Outcomes**: Students will be able to

CO1: Understand basic concepts of remote sensing and its physics.

CO2: Understand different platform for acquiring satellite images using remote sensing.

CO3: Understand various sensors used in Remote sensing to acquire data.

CO4: Analyze and apply thermal and hyper spectral remote sensing based on sensor characteristics.

CO5: Understand and analyze remote sensing data processing.

**Unit I: Physics of Remote Sensing**

Electro Magnetic Spectrum, Physics of Remote Sensing Effects of Atmosphere-Scattering– Different types–Absorption-Atmospheric window-Energy. Interaction with surface features – Spectral reflectance of vegetation, soil and water atmospheric influence on spectral response patterns-multi concept in Remote sensing.

**Unit 2: Data Acquisition**

Types of Platforms–different types of aircrafts-Manned and Un manned spacecrafts–sun synchronous and geo synchronous satellites –Types and characteristics of different platforms –LANDSAT, SPOT, IRS, INSAT, IKONOS, QUICKBIRD etc

**Unit III:** Photographic products, B/W, color, color IR film and their characteristics – resolving power of lens and film - Opto mechanical electro optical sensors –across track and along track scanners-multispectral scanners and thermal scanners–geometric characteristics of scanner imagery - calibration of thermal scanners. .

**Unit IV: Thermal and Hyper Spectral Remote Sensing**

Sensors characteristics-principle of Spectroscopy-imaging spectroscopy–field conditions, compound spectral curve, Spectral Library, radiative models, processing procedures, derivative spectrometry, thermal remote sensing thermal sensors, principles, thermal data processing, applications.

**Unit V: Data Analysis**

Resolution – Spatial, Spectral, Radiometric and temporal resolution-signal to noise ratio-data products and their characteristics-visual and digital interpretation–Basic principles of data processing – Radiometric correction–Image enhancement–Image classification– Principles of LiDAR, Aerial Laser Terrain Mapping.

**Text Books:**

1. Lillesand T.M., and Kiefer, R.W. Remote Sensing and Image interpretation, John Wiley &Sons-2000, 6$^{th}$Edit ion

2. John R. Jensen, Introductory Digital Image Processing: A Remote Sensing Perspective, 2nd Edition, 1995.

**References:**

1. A.Richards, Springer –Verlag, Remote Sensing Digital Image Analysis, 1999. Paul Curran P.J. Principles of Remote Sensing, ELBS; 1995.

2. Charles Elachi and Jakob J. van Zyl , Introduction To The Physics and Techniques of Remote Sensing , Wiley Series in Remote Sensing and Image Processing, 2006. Sabins, F.F.Jr, Remote Sensing Principles and Image interpretation, W.H.Freeman& Co, 1978

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES:: TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: II Semester: III Branch of Study: ECE Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DPE3814 | High Performance Networks | 3 | 0 | 0 | 3 |

**Course Outcomes**: Students will be able to

CO1: Apply knowledge of mathematics, probability, and statistics to model and analyze some networking protocols.

CO2: Identify formulate and solve network protocol issues.

CO3: Understand network routing and security issues.

CO4: Understand Traffic Modeling and network management and security.

CO5: Understand various standards in network management

**Unit I:**

Types of Networks, Network design issues, Data in support of network design. Network design tools, protocols and architecture. Streaming stored Audio and Video, Best effort service, protocols for real time interactive applications, beyond best effort, scheduling and policing mechanism, integrated services, and RSVP-differentiated services.

**Unit II:**

VoIP system architecture, protocol hierarchy, Structure of a voice endpoint, Protocols forthe transport of voice media over IP networks. Providing IP quality of service for voice, signalling protocols for VoIP, PSTN gateways, VoIP applications.

**Unit III:**

VPN-Remote-Access VPN, site-to-site VPN, Tunneling to PPP, Security in VPN. MPLS operation, Routing, Tunneling and use of FEC, Traffic Engineering, and MPLS based VPN, overlaynetworks-P2P connections.

**Unit IV: Traffic Modeling**

**Traffic Modeling:** Little‟s theorem, Need for modeling, Poisson modeling, Non-poisson models, Network performance evaluation.

**Network Security and Management:** Principles of cryptography, Authentication, integrity, key distribution and certification, Access control and fire walls, attacks and counter measures, security in many layers.

**Unit V:**

Infrastructure for network management, the internet standard management framework –SMI, MIB, SNMP, Security and administration, ASN.1.

**Text Books:**

1. Kershenbaum A., “Telecommunications Network Design Algorithms”, Tata McGraw Hill
2. Larry Peterson & Bruce David, “Computer Networks: A System Approach”, MorganKaufmann, 2003.

**Reference Books:**

1. Douskalis B., “IP Telephony: The Integration of Robust VoIP Services”, Pearson Ed. Asia,2000.
2. Warland J., Varaiya P., “High-Performance Communication Networks”, MorganKaufmann, 1996.

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES:: TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: II Semester: III Branch of Study: ECE Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DPE3815 | MIMO Systems | 3 | 0 | 0 | 3 |

**Course Outcomes**: Students will be able to
CO1: Understand channel modelling and propagation, MIMO Concepts
CO2: Understand cooperative and coordinated multi-cell MIMO,
CO 3: Perform Mathematical modelling and analysis of MIMO systems.
CO4: Understand MIMO in LTE and Time & frequency channel dispersion
CO5: Understand channel Estimation and different channel estimation techniques

**Unit I:**
Introduction to Multi-antenna Systems, Motivation, Types of multi-antenna systems, MIMO vs. multi-antenna systems. Diversity, Exploiting multipath diversity, Transmit diversity, Space-time codes, The Alamouti scheme, Delay diversity, Cyclic delay diversity, Space-frequency codes, Receive diversity, The rake receiver, Combining techniques, Spatial Multiplexing, Spectral efficiency and capacity, Transmitting independent streams in parallel, Mathematical notation

**Unit II:** The generic MIMO problem, Singular Value Decomposition, Eigen values and eigenvectors, Equalising MIMO systems, Disadvantages of equalising MIMO systems, Predistortion in MIMO systems, Disadvantages of pre-distortion in MIMO systems, Pre-coding and combining in MIMO systems, Advantages of pre-coding and combining, Disadvantages of precoding and combining, Channel state information.

**Unit III:** Codebooks for MIMO, Beam forming, Beam forming principles, Increased spectrum efficiency, Interference cancellation, Switched beam former, Adaptive beam former, Narrowband beam former, Wideband beam former

**Unit IV:** Case study: MIMO in LTE, Code words to layers mapping, Pre-coding for spatial multiplexing, Pre-coding for transmit diversity, Beam forming in LTE, Cyclic delay diversity based pre-coding, Pre-coding codebooks, Propagation Channels, Time & frequency channel dispersion, AWGN and multipath propagation channels, Delay spread values and time variations, Fast and slow fading environments, Complex baseband multipath channels, Narrowband and wideband channels, MIMO channel models

**Unit V:** Channel Estimation, Channel estimation techniques, Estimation and tracking, Training based channel estimation, Blind channel estimation, Channel estimation architectures, Iterative channel estimation, MMSE channel estimation, Correlative channel sounding, Channel estimation in single carrier systems, Channel estimation for CDMA, Channel estimation for OFDM.

**Text Books:**


1. Claude Oestges, Bruno Clerckx, "MIMO Wireless Communications: From Real-world Propagation to Space-time Code Design",Academic Press, 1st edition, 2010.
2. Mohinder Janakiraman, “Space - Time Codes and MIMO Systems”, Artech House Publishers, 2004.

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES:: TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: II Semester: III Branch of Study: ECE Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DOE5801 | Business Analytics | 3 | 0 | 0 | 3 |

**Course Outcomes**: Students will be able to

CO1: Students will demonstrate knowledge of data analytics.

CO2: Students will demonstrate the ability of think critically in making decisions based on data and deep analytics

CO3: Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making

CO4: Students will demonstrate the ability to translate data into clear, actionable insights.

**Unit I: Business Analytics**

Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.

**Unit II: Trendiness and Regression Analysis**

Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

**Unit III:** 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, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

**Unit IV: 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 Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

**Unit V: Decision Analysis**

Formulating Decision Problems, Decision Strategies 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.

**Text Books:**

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.

**Referencs:**

1. Business Analytics by James Evans, persons Education.

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES:: TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**
**Year: II Semester: III Branch of Study: ECE**
**Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DOE9001 | Industrial Safety | 3 | 0 | 0 | 3 |

Course Outcomes:
CO: 1 Analyze the basics of industrial safety.
CO: 2 Understand the Fundamentals of maintenance engineering
CO: 3 Apply the methods of prevention of corrosion and wear.
CO: 4 Understand the Fault tracing and their applications.
CO: 5 Understand the methods of preventive measures and maintenance

**Unit I**

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 II**

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 III**

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 IV**

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 V**

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

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES:: TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: II Semester: III Branch of Study: ECE**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DOE9002 | Operations Research | 3 | 0 | 0 | 3 |

Course Outcomes:
CO: 1 Understand the characteristics and phases, types of models, allocation in linear programming
CO: 2 Apply the concept of optimal solution, unbalanced problem, degeneracy and Transportation problem & sequencing.
CO: 3 Understand the concept of replacement of items and related problems, theory of games related problems
CO: 4 Apply the concept of the knowledge of queuing models, inventory management models.
CO: 5 Apply the knowledge of dynamic programming, the concept of the simulation and simulation languages.

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

**Unit II**
Formulation of a LPP - Graphical solution revised simplex method - duality theory – dual simplex method - sensitivity analysis - parametric programming.

**Unit III**
Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max Flowproblem - CPM/PERT

**Unit IV**
Scheduling and sequencing - single server and multiple server models - deterministic Inventorymodels - Probabilistic inventory control models - Geometric Programming.

**Unit V**
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

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES:: TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: II Semester: III Branch of Study: ECE Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DOE9004 | Composite Materials | 3 | 0 | 0 | 3 |

Course Outcomes:
CO: 1 Understanding of basic concepts and charactestics of geometric and physical applications of composites.
CO: 2 Explain different reinforcements and their properties.
CO: 3 Study of micromechanics and properties of composite material.
CO: 4 Study of coordinate transformations of stress and strain laws.
CO: 5 Study of elastic behaviour of unidirectional composites; Joining Methods and Failure Theories

**UNIT-I**

Introduction: Definitions, Composites, Reinforcements and matrices, Types of reinforcements,Types of matrices, Types of composites, Carbon Fibre composites, Properties of composites in comparison with standard materials,
Reinforcements: Fibres- Glass, Silica, Kevlar, carbon, boron, silicon carbide, and born carbide fibres. Particulate composites, Polymer composites, Thermoplastics, Thermosetts, Metal matrix and ceramic composites.

**UNIT-II**

Manufacturing methods :
Hand and spray lay - up, injection molding, resin injection, filament winding, pultrusion, centrifugal casting and prepregs. Fibre/Matrix Interface, mechanical.
Measurement of interface strength. Characterization of systems; carbon fibre/epoxy, glass fibre/polyester, etc.

**UNIT-III**

Micromechanics: Unidirectional composites, constituent materials and properties, elastic properties of a lamina, properties of typical composite materials, laminate characteristics and configurations. Characterization of composite properties.
Mechanical Testing: Determination of stiffness and strengths of unidirectional composites; tension, compression, flexure and shear.

**UNIT-IV**

Coordinate transformations: Hooke"s law for different types of materials, Hooke"s law for two dimensional unidirectional lamina, Transformation of stress and strain, Numerical examples of stress strain transformation, Graphic interpretation of stress – strain relations. Off - axis, stiffness modulus, off - axis compliance.

**UNIT-V**

Elastic behavior of unidirectional composites: Elastic constants of lamina, relationship between engineering constants and reduced stiffness and compliances, analysis of laminated composites, constitutive relations
Joining Methods and Failure Theories: Joining –Advantages and disadvantages of adhesive and mechanically fastened joints. Typical bond strengths and test procedures.

**Text Books:**

1. Chawla, Krishan K, Composite Materials Science and Engineering, Springer, 3rd Edition 2012.
2. R. M. Jones, Mechanics of Composite Materials, Mc Graw Hill Company, New York, 1975.

**References:**

1. B. D. Agarwal and L. J. Broutman, Analysis and performance of fibre Composites, Wiley-Interscience, New York, 1980.
2. L. R. Calcote, Analysis of Laminated Composite Structures, Van Nostrand Rainfold, New York, 1969.
3. Engineering Mechanics of Composite Materials by Isaac and M.Daniel, Oxford University Press, 1994

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES:: TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: II Semester: III Branch of Study: ECE Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DOE2001 | Waste to Energy | 3 | 0 | 0 | 3 |

Course Outcomes: At the end of the course, students will be able to
1. Able to classify types of wastes
2. Understand the method of pyrolysis
3. Understand the use and application of Biomass gasifiers
4. Design biomass combustors
5. Analyze the properties of Biogas

**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.

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES:: TIRUPATI**
**(AUTONOMOUS)**
**AK22 Regulations**
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**Year: II Semester: III Branch of Study: ECE Specialization: DECS**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 22DOE2002 | Project Management | 3 | 0 | 0 | 3 |

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

1. Able to understand the importance of construction project management, organization and leadership capabilities
2. Able to apply theoretical and practical aspects of project management planning techniques to achieve project goals.
3. Possess ideas on contract, tender and arbitration in construction projects.
4. Understand to apply knowledge and skills of quality and safety management in construction.
5. Have necessary knowledge in resource planning, costing and accounting.

**Unit I**

Introduction to Project management:Characteristics of projects, Definition and objectives of Project Management, Stages of Project Management, Project Planning Process, Establishing Project organization.

**UNIT-II**

Project Planning:Planning techniques- Bar Chart, Gantt Charts- Networks: basic terminology, preparation of CPM-computation of float values, critical paths-PERT- Determination of three time estimates- Comparison between CPM and PERT

**UNIT-III**

Resources Management:Flow chart of Resources Management, Labour‟s requirement, Factors behind the selection of equipment, Material Management- flow chart and functions.

Cost and Accounts Management:Cost–volume relationship-BasicCost Control System-Principle of accounting, Account process, Balance sheet.

**Unit IV**

Project Implementation: Project Monitoring and Control with PERT/Cost, Computers applications in Project Management, Contract Management, Project Procurement Management.

**UNIT-V**

Quality management

Inspection, quality control and quality assurance in projects- Cost of quality, cost versus quality levels- ISO standards- benefits-ISO 9001-2000 family of standards- Audit- types, ISO 9001-2000 for internal audit.

Safety management

Cause for accident in construction site- -Principle of safety- Role of safety personnel‟s - General safety conditions

Text/Reference Books:

**REFERENCES:**


1. Kumar Neeraj Jha, Construction Project Management Theory & Practice, Pearson Education Ltd., 2014.
2. Chitkara.K.K., Construction Project Management Planning Scheduling and Controlling, TataMcGraw-Hill, 2014
3. Project Planning And Control With PERT And CPM By Dr.B.C.Punmia, K.K.Khandelwal, Lakshmi Publications New Delhi.

4. Total Project Management, The Indian Context- By : P.K.JOY- Mac Millan Publishers India Limited.

**Additional Readings:**

1. John M Nicholas, Project Management for Business and Technology: Principles and Practice, Prentice Hall,
India, 2002.
2. N. J. Smith (Ed), Project Management, Blackwell Publishing, 2002.
3. Robert K. Wysocki, Robert Back Jr. and David B. Crane, Effective Project Management, John Wiley, 2002.
4. Jack R Meredith and Samuel J Mantel, Project Management: A Managerial Approach, John Wiley, 2000.