JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.TECH. SYSTEMS AND SIGNAL PROCESSING
EFFECTIVE FROM ACADEMIC YEAR 2019-20 ADMITTED BATCH

R19 COURSE STRUCTURE AND SYLLABUS

I YEAR I – SEMESTER

Course Code	Course Title	L	T	P	Credits
Professional Core - I	Advanced Digital Signal Processing	3	0	0	3
Professional Core - II	Image and Video Processing	3	0	0	3
Professional Elective - I	1. Transform Techniques 2. Detection and Estimation Theory 3. Random Processes and Queuing Theory	3	0	0	3
Professional Elective - II	1. Biomedical Signal Processing 2. Pattern Recognition & Machine Learning 3. Coding theory and Techniques	3	0	0	3
Lab - I	Advanced Digital Signal Processing Lab	0	0	3	2
Lab - II	Image and Video Processing Lab	0	0	3	2
	Research Methodology & IPR	2	0	0	2
Audit - I	Audit Course - I	2	0	0	0
	Total	**16**	**0**	**6**	**18**

I YEAR II – SEMESTER

Course Code	Course Title	L	T	P	Credits
Professional Core - III	Adaptive Signal Processing	3	0	0	3
Professional Core - IV	Digital Signal Processors and Architectures	3	0	0	3
Professional Elective - III	1. Neural Networks and Fuzzy Systems 2. Radar Signal Processing 3. Deep Learning	3	0	0	3
Professional Elective - IV	1. Speech and Audio Signal Processing 2. Network Security and Cryptography 3. Wireless Communications and Networks	3	0	0	3
Lab - III	Adaptive Signal Processing Lab	0	0	3	2
Lab - IV	Digital Signal Processors and Architectures Lab	0	0	3	2
	Mini project with Seminar	0	0	4	2
Audit - II	Audit Course- II	2	0	0	0
	Total	**14**	**0**	**10**	**18**

II YEAR I – SEMESTER

Course Code	Course Title	L	T	P	Credits
Professional Elective - V	1. VLSI Signal Processing 2. IOT and its Applications 3. Smart Antenna and Array Signal Processing	3	0	0	3
Open Elective	Open Elective	3	0	0	3
Dissertation	Dissertation Work Review - II	0	0	12	6
	Total	**6**	**0**	**12**	**12**

II YEAR II - SEMESTER

Course Code	Course Title	L	T	P	Credits
Dissertation	Dissertation Work Review - III	0	0	12	6
Dissertation	Dissertation Viva-Voce	0	0	28	14
	Total	**0**	**0**	**40**	**20**

***For Dissertation Work Review - I, Please refer 7.8 in R19 Academic Regulations.**

Audit Course I & II:

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- I SEMESTER
SYSTEMS AND SIGNAL PROCESSING

ADVANCED DIGITAL SIGNAL PROCESSING (PC – I)

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

1. To understand theory of different filters and algorithms
2. To understand theory of multirate DSP, solve numerical problems and write algorithms
3. To understand theory of prediction and solution of normal equations
4. To know applications of DSP at block level.

UNIT I

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, parallel realization of IIR.

UNIT-II

Multi rate DSP, Decimators and Interpolators, Sampling rate conversion, multistage decimator & interpolator, poly phase filters, QMF, digital filter banks, Applications in subband coding.

UNIT-III

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-IV

Adaptive Filters, Applications, Gradient Adaptive Lattice, Minimum mean square criterion, LMS algorithm, Recursive Least Square algorithm

UNIT-V

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.

TEXTBOOKS:

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.

REFERENCES:

1. Bruce W. Suter, “Multirate and Wavelet Signal Processing”,1st Edition, Academic Press, 1997.
2. M. H. Hayes, “Statistical Digital Signal Processing and Modeling”, John Wiley & Sons Inc., 2002.
3. S. Haykin, “Adaptive Filter Theory”, 4th Edition, Prentice Hall, 2001.
4. D. G. Manolakis, V. K. Ingle and S. M. Kogon, “Statistical and Adaptive Signal Processing”, McGraw Hill, 2000

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH. I YEAR - I SEMESTER
SYSTEMS AND SIGNAL PROCESSING

IMAGE AND VIDEO PROCESSING (PC - II)

Prerequisite: Digital Signal Processing

Course Objectives:

1. The student will be able to understand the quality improvement methods of Image.
2. To study the basic digital image and video filter operations.
3. Understand the fundamentals of Image Compression.
4. Understand the Representation of video, principles and methods of motion estimation.

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

1. Learn the image representation, and fundamental processing steps of an image.
2. Know the different enhancement techniques in both spatial and frequency domains.
3. Understand the importance of compression and different compression techniques.
4. Learn the representation, modeling and motion estimation of Video.

UNIT – I

Fundamentals of Image Processing and Image Transforms: Basic steps of Image Processing System Sampling and Quantization of an image, Basic relationship between pixels.
Image Segmentation: Segmentation concepts, Point, Line and Edge Detection, Thresholding, Region based segmentation.

UNIT – II

Image Enhancement: Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, smoothing spatial filters, Sharpening spatial filters.
Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering.

UNIT – III

Image Compression: Image compression fundamentals - Coding Redundancy, Spatial and Temporal redundancy, Compression models: Lossy & Lossless, Huffman coding, Bit plane coding, Transform coding, Predictive coding, Wavelet coding, Lossy Predictive coding, JPEG Standards.

UNIT - IV

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

UNIT – V

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

TEXT BOOKS:

1. Digital Image Processing – Gonzalez and Woods, 4th Ed., Pearson, 2018.
2. Digital Video Processing – M. Tekalp, Prentice Hall International

REFRENCE BOOKS:

1. Video Processing and Communication – Yao Wang, Joem Ostermann and Ya–quin Zhang. 1st Ed., PH Int.
2. Digital Image Processing – S. Jayaraman, S. Esakkirajan, T. Veera Kumar –TMH, 2009

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH. I YEAR - I SEMESTER
SYSTEMS AND SIGNAL PROCESSING

TRANSFORM TECHNIQUES (PE- I)

Prerequisite: None

Course Objectives

1. To learn basics of two-dimensional transform.
2. Understand the various two-dimensional transform definition, properties and applications.
3. Understand the design of filter Bank structure.
4. To learn the fundamentals of wavelet, transform and special wavelets.

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

1. The student will learn basics of two-dimensional transforms.
2. Understand the definition, properties and applications of various two-dimensional transform.
3. Understand the basic concepts of wavelet transform.
4. Understand the special topics such as wavelet packets, Bi-orthogonal wavelets e.t.c.

UNIT -I

Fourier Analysis: Vector space, Hilbert spaces, Fourier basis, FT- Limitations of Fourier Analysis, Need for time-frequency analysis, DFT, 2D-DFT: Definition, Properties and Applications, IDFT, Hilbert Transform, STFT.

UNIT -II

Transforms: Walsh, Hadamard, Haar and Slant Transforms, DCT, DST, KLT, – definition, properties and applications

UNIT -III

Continuous Wavelet Transform (CWT): Short comings 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- Tiling of time scale plane for CWT. Important Wavelets: Haar, Mexican Hat, Meyer, Shannon, Daubechies.

UNIT -IV

Multi Rate Analysis and DWT: Need for Scaling function – Multi Resolution Analysis, Two-Channel Filter Banks, Perfect Reconstruction Condition, Relationship between Filter Banks and Wavelet Basis, DWT, Structure of DWT Filter Banks, Daubechies Wavelet Function, Applications of DWT.

UNIT -V

Special Topics: Wavelet Packet Transform, Multidimensional Wavelets, Bi-orthogonal basis- B-Splines, Lifting Scheme of Wavelet Generation, Multi Wavelets

TEXT BOOKS:

1. Wavelet Transforms-Introduction theory and applications -Raghuveer M.Rao and Ajit S. Bopardikar, Pearson Edu, Asia, New Delhi, 2003.
2. “Insight into Wavelets from Theory to practice “, Soman. K. P, Ramachandran. K.I, Printice Hall India, First Edition, 2004.

REFERENCES:

1. “Fundamentals of Wavelets- Theory, Algorithms and Applications”, Jaideva C Goswami, Andrew K Chan, John Wiley & Sons, Inc, Singapore, 1999.
2. “Wavelets and sub-band coding”, Vetterli M. Kovacevic, PJI, 1995.
3. “Introduction to Wavelets and Wavelet Transforms”, C. Sydney Burrus, PHI, First Edition, 1997.
4. “A Wavelet Tour of Signal Processing”, Stephen G. Mallat, Academic Press, Second Edition, 2008.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- I SEMESTER
SYSTEMS AND SIGNAL PROCESSING

DETECTION AND ESTIMATION THEORY (PE - I)

Prerequisite: Probability Theory and Stochastic Processes

Course Objectives: The main objectives of the course are:

1. The main objective of this course is to provide basic estimation and detection background for engineering applications.
2. This course provides the main concepts and algorithms for detection and estimation theory.
3. Students learn the statistics and estimating the parameters of Random Process from detection.
4. To apply estimation methods for real time engineering problems.

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

1. Understand the basic Random Process and detection methods.
2. Known the significance of Probability of error
3. Learn about basic estimation methods and filters
4. Measure the statistical parameters for random processes

UNIT –I

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

UNIT –II

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

UNIT –III

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

UNIT –IV

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

UNIT –V

Estimating the Parameters of Random Processes from Data: Tests for Stationarity and Ergodicity, Model-free Estimation, Model-based Estimation of Autocorrelation Functions, Power Special Density Functions.

TEXT BOOKS:

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

REFERENCES:

1. Fundamentals of Statistical Signal Processing: Volume I Estimation Theory– Steven. M. Kay, Prentice Hall, USA, 1998.
2. Introduction to Statistical Signal Processing with Applications – Srinath, Rajasekaran, Viswanathan, 2003, PHI.
3. Statistical Signal Processing: Detection, Estimation and Time Series Analysis – Louis L. Scharf, 1991, Addison Wesley.
4. Signal Processing: Discrete Spectral Analysis – Detection & Estimation – Mischa Schwartz, Leonard Shaw, 1975, Mc Graw Hill.

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SYSTEMS AND SIGNAL PROCESSING

RANDOM PROCESSES AND QUEUING THEORY (PE - I)

Prerequisite: Probability Theory & Stochastic Processes

Course Objectives: The main objectives of the course are:

1. To explore in the random process and queuing theory useful for Computer and communication Networks.
2. Understand Random variables as an intrinsic need for the analysis of random phenomena.
3. To understand the modeling of telecommunication networks using appropriate queuing process.
4. To know the need of Markov chains and queuing theory in communication networks.

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

1. Evaluate and apply moments and Characteristics functions.
2. Understand the concept of random process spectral density of stationary process.
3. Understand the concepts of Markov Chains and queuing theory.
4. Understand the concepts of M| M|1, M|M|1|K, M|G|1 queuing Process.

UNIT -I

Random Variable: Random Variables-Basic Definitions and properties, Sum of independent random variables, Minimum and Maximum of random variables, Comparisons between random variables, Moments of the random variables, Random variables in the field of telecommunications, Transformations of random variables-The probability generating function, the characteristic function of a pdf, The Laplace Transform of a pdf, Methods for the generation of random variables- Method of the inverse of the distribution function, Method of the transformation.

UNIT- II

Random Processes: The Random Process Concept, Concept of Stationarity and Statistical Independence, First Order Stationary Processes, Second Order and Wide Sense Stationary, (N-Order) and Strict Sense Stationarity, Time Averages and Ergodicity, Mean Ergodic Processes, Correlation Ergodic Processes, Autocorrelation Function and its Properties, Cross Correlation function and its properties, Covariance Functions, The Power Spectrum- Properties, Relationship between Power spectrum and Autocorrelation function.

UNIT- III

Markov Chains and Queuing Theory: Queues, Poisson arrival process- Sum of independent Poisson processes, Random splitting of a Poisson process, Compound Poisson processes, Birth death Markov chains, Formulation of Hidden Markov Model (HMM), building, evaluation and decoding of HMM, Notations for Queuing systems, The Little Theorem, M/M/1 queue analysis, M/M/1/K queue analysis, M/M/S queue analysis, M/M/S/S queue analysis, The M/M/∞ queue analysis, Distribution of the queuing delays in the FIFO case- M/M/1 case, M/M/S case.

UNIT - IV

M/G/1 Queuing Theory: M/G/1 queue, M/G/1 system delay distribution in the FIFO case, Laplace Transform numerical inversion method, Generalizations of the M/G/1 theory, Different imbedding instants in the M/G/1 theory, M/G/1 with geometrically distributed messages.

UNIT - V

Local Area Network Analysis: Introduction, Contention based protocols- Aloha, Slotted Aloha, Aloha Protocol with ideal capture effect, CSMA Schemes, Demand assignment protocols-Polling protocol, Token passing protocol, Analysis of token and polling Schemes, R-Aloha, PRMA protocol, Comparisons between CSMA/CD and Token Protocols, Fixed assignment Protocols- FDMA, TDMA, Resource reuse in cellular systems, CDMA.

TEXTBOOKS:

1. Probability, Random Variables & Random Signal Principles-Peyton Z. Peebles, TMH, 4th Edition,2001.
2. Queuing Theory and Telecommunications Networks and Applications, Springer, Giovanni Giambene, 2014.

REFERENCES:

1. Probability, Random Variables and Stochastic Processes – Athanasios Papoulis, S. Unnikrishna Pillai – TMH, 2008
2. Probability and Random Processes with Applications to Signal Processing – Henry Stark, John W. Woods, 3rd Edition, Pearson, 2003
3. Probability and Stochastic Processes – A Friendly Introduction for Electrical and Computer Engineers – Roy D. Yates, David J. Goodman.2014
4. Digital Processing of Speech Signals. L. R Rabinar and R W Jhaung, 1978, PHI.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- I SEMESTER
SYSTEMS AND SIGNAL PROCESSING

BIOMEDICAL SIGNAL PROCESSING (PE - II)

Prerequisite: Advanced Digital Signal Processing

Course Objectives: The main objectives of the course are:

1. To use basic probability theory to model random signals in terms of Random Processes.
2. To understand various cardiological signal processing techniques and noise cancellation techniques.
3. To understand estimation of signals using Prony's and least square and linear prediction methods.
4. To comprehend EEG signals, modeling and sleep stages.

Course Outcomes: After studying the course, each student is expected to be able to:

1. Use probability theory to model random processes.
2. Compare various lossless and lossy data compression techniques.
3. Compare various ECG processing and noise cancellation techniques.
4. Model and estimate EEG signals and various sleep stages.

UNIT -I

Random Processes: Stationary random process, Ergodicity, Power spectral density and autocorrelation function of random processes. Noise power spectral density analysis, Noise bandwidth and noise figure of systems.

UNIT -II

Data Compression Techniques: Lossy and Lossless data reduction Algorithms. ECG data compression using Turning point, AZTEC, CORTES, Huffman coding, vector quantisation, DICOM Standards

UNIT -III

Cardiological Signal Processing: Pre-processing, QRS Detection Methods, Rhythm analysis, Arrhythmia Detection Algorithms, Automated ECG Analysis, ECG Pattern Recognition.
Adaptive Noise Cancelling: Principles of Adaptive Noise Cancelling, Adaptive Noise Cancelling with the LMS Adaptation Algorithm, Noise Cancelling Method to Enhance ECG Monitoring, Fetal ECG Monitoring.

UNIT -IV

Signal Averaging, polishing: Mean and trend removal, Prony's method, Prony's Method based on the Least Squares Estimate, Linear prediction, Yule – Walker (Y –W) equations, Analysis of Evoked Potentials.

UNIT -V

Neurological Signal Processing: Modelling of EEG Signals, Detection of spikes and spindles Detection of Alpha, Beta and Gamma Waves. Auto Regressive (A.R.) modelling of seizure EEG. Sleep Stage analysis, Inverse Filtering, Least squares and polynomial modelling.

TEXT BOOKS:

1. Probability, Random Variables & Random Signal Principles – Peyton Z. Peebles, 4th Ed., TMH, 2009.
2. Biomedical Signal Processing- Principles and Techniques - D. C. Reddy, TMH, 2005.

REFERENCES:

1. Digital Bio Dignal Processing - Weitkunat R, Elsevier, 1991.
2. Biomedical Signal Processing -Vol. I Time & Frequency Analysis - Cohen.A, CRC Press, 1986.
3. Biomedical Digital Signal Processing: C-Language Experiments and Laboratory Experiments, Willis J. Tompkins, PHI, 1998.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH. I YEAR - I SEMESTER
SYSTEMS AND SIGNAL PROCESSING

PATTERN RECOGNITION AND MACHINE LEARNING (PE - II)

Prerequisite: Statistics and Linear Algebra

Course Objectives:

1. The student will be able to understand the mathematical formulation of patterns.
2. To study the various linear models.
3. Understand the basic classifiers.
4. Can able to distinguish different models.

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

1. Learn the basics of pattern classes and functionality.
2. Construct the various linear models.
3. Understand the importance kernel methods.
4. Learn the Markov and Mixed models.

UNIT-I

Introduction to Pattern recognition: Mathematical Formulation and Basic Functional Equation, Reduction of Dimensionality, Experiments in Pattern Classification, Backward Procedure for Both Feature Ordering- and Pattern Classification, Suboptimal Sequential Pattern Recognition, Nonparametric Design of Sequential Pattern Classifiers, Analysis of Optimal Performance and a Multiclass Generalization

UNIT-II

Linear Models: Linear Basis Function Models -Maximum likelihood and least squares, Geometry of least squares , Sequential learning, Regularized least squares, Multiple outputs , The Bias-Variance Decomposition, Bayesian Linear Regression -Parameter distribution, Predictive, Equivalent, Bayesian Model Comparison, Probabilistic Generative Models-Continuous inputs, Maximum likelihood solution, Discrete features, Exponential family, Probabilistic Discriminative Models -Fixed basis functions, Logistic regression, Iterative reweighted least squares, Multiclass logistic regression, Probit regression, Canonical link functions

UNIT-III

Kernel Methods: Constructing Kernels, Radial Basis Function Networks - Nadaraya-Watson model, Gaussian Processes -Linear regression revisited, Gaussian processes for regression, Learning the hyper parameters, Automatic relevance determination, Gaussian processes for classification, Laplace approximation, Connection to neural networks, Sparse Kernel Machines- Maximum Margin Classifiers, Overlapping class distributions, Relation to logistic regression, Multiclass SVMs, SVMs for regression, Computational learning theory, Relevance Vector Machines- RVM for regression, Analysis of sparsity, RVM for classification

UNIT-IV

Graphical Models: Bayesian Networks, Example: Polynomial regression, Generative models, Discrete variables, Linear-Gaussian models, Conditional Independence- Three example graphs, D-separation, Markov Random Fields -Conditional independence properties, Factorization properties, Illustration: Image de-noising, Relation to directed graphs, Inference in Graphical Models- Inference on a chain, Trees, Factor graphs, The sum-product algorithm, The max-sum algorithm, Exact inference in general graphs, Loopy belief propagation, Learning the graph structure.

UNIT-V

Mixture Models and EM algorithm: K-means Clustering-Image segmentation and compression, Mixtures of Gaussians-Maximum likelihood, EM for Gaussian mixtures, An Alternative View of EM-Gaussian mixtures revisited, Relation to K-means, Mixtures of Bernoulli distributions, EM for Bayesian linear regression, The EM Algorithm in General, Combining Models- Tree-based Models, Conditional Mixture Models- Mixtures of linear regression models, Mixtures of logistic models, Mixtures of experts.

TEXT BOOKS:

1. Sequential methods in Pattern Recognition and Machine Learning-K.S.Fu, Academic Press, volume no.52.
2. Pattern Recognition and Machine Learning- C. Bishop-Springer,2006.

REFERENCES:

1. Pattern Classification- Richard o. Duda, Peter E. hart, David G. Stork, John Wiley& Sons, 2nd Ed., 2001.
2. The elements of Statistical Learning- Trevor Hastie, Robert Tibshirani, Jerome H. Friedman, Springer, 2nd Ed., 2009.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH. I YEAR - I SEMESTER
SYSTEMS AND SIGNAL PROCESSING

CODING THEORY AND TECHNIQUES (PE - II)

Prerequisite: Digital Communications

Course Objectives

1. To acquire the knowledge in measurement of information and errors.
2. T study the generation of various code methods.
3. To study the various application of codes.

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

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

UNIT – I

Coding for Reliable Digital Transmission and storage: Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.

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

UNIT - II

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

UNIT – III

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

UNIT – IV

Turbo Codes LDPC Codes- Codes based on sparse graphs, Decoding for binary erasure channel, Log-likelihood algebra, Brief propagation, Product codes, Iterative decoding of product codes, Concatenated convolutional codes- Parallel concatenation, The UMTS Turbo code, Serial concatenation, Parallel concatenation, Turbo decoding

UNIT - V

Space-Time Codes Introduction, Digital modulation schemes, Diversity, Orthogonal space- Time Block codes, Alamouti's schemes, Extension to more than Two Transmit Antennas, Simulation Results, Spatial Multiplexing: General Concept, Iterative APP Preprocessing and Per-layer Decoding, Linear Multilayer Detection, Original BLAST Detection, QL Decomposition and Interface Cancellation, Performance of Multi – Layer Detection Schemes, Unified Description by Linear Dispersion Codes.

TEXT BOOKS

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

REFERENCES

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

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SYSTEMS AND SIGNAL PROCESSING

ADVANCED DIGITAL SIGNAL PROCESSING LAB (LAB – I)

Note: Minimum of 10 Experiments have to be conducted

1. Basic Operations on Signals, Generation of Various Signals and finding its FFT.
2. Program to verify Decimation and Interpolation of a given Sequences.
3. Program to Convert CD data into DVD data
4. Generation of Dual Tone Multiple Frequency (DTMF) Signals
5. Plot the Periodogram of a Noisy Signal and estimate PSD using Periodogram and Modified Periodogram methods
6. Estimation of Power Spectrum using Bartlett and Welch methods
7. Verification of Autocorrelation Theorem
8. Parametric methods (Yule-Walker and Burg) of Power Spectrum Estimation
9. Estimation of data series using Nth order Forward Predictor and comparing to the Original Signal
10. Design of LPC filter using Levinson-Durbin Algorithm
11. Computation of Reflection Coefficients using Schur Algorithm
12. To study Finite Length Effects using Simulink
13. ECG signal compression
14. Design and Simulation of Notch Filter to remove 60 Hz Hum/any unwanted frequency component of given Signal (Speech/ECG)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- I SEMESTER
SYSTEMS AND SIGNAL PROCESSING

IMAGE AND VIDEO PROCESSING LAB (LAB – II)

Note: Minimum of 10 Experiments have to be conducted

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- I SEMESTER
SYSTEMS AND SIGNAL PROCESSING

RESEARCH METHODOLOGY AND IPR

Prerequisite: None

Course Objectives:

- To understand the research problem
- To know the literature studies, plagiarism and ethics
- To get the knowledge about technical writing
- To analyze the nature of intellectual property rights and new developments
- To know the patent rights

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

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

UNIT-I:

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT-II:

Effective literature studies approaches, analysis, Plagiarism, Research ethics

UNIT-III:

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-IV:

Nature of Intellectual Property: 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-V:

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.

TEXT BOOKS:

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineering students’”
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”

REFERENCES:

1. Ranjit Kumar, 2nd Edition, “Research Methodology: A Step by Step Guide for beginners”
2. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd ,2007.
3. Mayall, “Industrial Design”, McGraw Hill, 1992.
4. Niebel, “Product Design”, McGraw Hill, 1974.
5. Asimov, “Introduction to Design”, Prentice Hall, 1962.
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “Intellectual Property in New Technological Age”, 2016.
1. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- II SEMESTER
SYSTEMS AND SIGNAL PROCESSING

ADAPTIVE SIGNAL PROCESSING (PC – III)

Prerequisite: Digital Signal Processing

Course Objectives: The main objectives of the course are:

- This course focuses on problems algorithms and solutions for processing signals in an manner that is responsive to a changing environment.
- To develop systems on recursive, model-based estimation methods taking the advantage of the statistical properties of the received signals.
- To analyze the performance of adaptive filters and considers the application of the theory to a variety of practical problems such as beam forming and echo cancellation signal.
- To understand innovation process, Kalman filter theory and estimation of state using the innovation process, concept of Kalman Gain and Filtering.

Course Outcomes: After studying the course, the student is expected to be able to :

- Design and apply optimal minimum mean square estimators and in particular linear estimators.
- Understand and compute their expected performance and verify it.
- Design, implement and apply Wiener Filters (FIR, non-casual, causal) and evaluate their performance.
- To understand innovation process, Kalman filter theory and estimation of state using the Innovation Process, concept of Kalman Gain and Filtering.
- Design, implement and apply LMS, RLS and Kalman filters to given applications.

UNIT –I

Introduction to Adaptive Systems: Definitions, Characteristics, Applications, Example of an Adaptive System. The Adaptive Linear Combiner - Description, Weight Vectors, Desired Response Performance function - Gradient & Mean Square Error.

UNIT –II

Development of Adaptive Filter Theory & Searching the Performance surface: Introduction to Filtering - Smoothing and Prediction – Linear Optimum Filtering, Problem statement, Principle of Orthogonally - Minimum Mean Square Error, Wiener- Hopf equations, Error Performance - Minimum Mean Square Error.

UNIT –III

Steepest Descent Algorithms: Searching the performance surface – Methods & Ideas of Gradient Search methods - Gradient Searching Algorithm & its Solution - Stability & Rate of convergence - Learning Curves Gradient Search by Newton's Method, Method of Steepest Descent, Comparison of Learning Curves.

UNIT –IV

LMS Algorithm & Applications: Overview - LMS Adaptation algorithms, Stability & Performance analysis of LMS Algorithms - LMS Gradient & Stochastic algorithms - Convergence of LMS algorithm.
Applications: Noise cancellation – Cancellation of echoes in long distance telephone circuits, Adaptive Beam forming.

UNIT –V

Kalman Filtering: Introduction to RLS Algorithm, Statement of Kalman filtering problem, The Innovation Process, Estimation of State using the Innovation Process- Expression of Kalman Gain, Filtering Examples using Kalman filtering.

TEXT BOOKS:

1. Adaptive Signal Processing - Bernard Widrow, Samuel D. Strearns, PE, 2005.
2. Adaptive Filter Theory - Simon Haykin-, 4th Ed., PE Asia 2002.

REFERENCES:

1. Optimum signal processing: An introduction - Sophocles. J. Orfamadis, 2 Ed., McGraw-Hill, New York, 1988.
2. Adaptive signal processing-Theory and Applications, S. Thomas Alexander, Springer –Verlag, 1986.
3. Siganl analysis – Candy, Mc Graw Hill Int. Student Edition
4. James V. Candy, Signal Processing: A Modern Approach, McGraw-Hill, International Edition, 1988.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- II SEMESTER
SYSTEMS AND SIGNAL PROCESSING

DIGITAL SIGNAL PROCESSORS AND ARCHITECTURES (PC – IV)

Prerequisite: Digital Signal Processing

Course Objectives: The main objectives of the course are:

- To provide a comprehensive understanding of various programs of Digital Signal Processors.
- To distinguish between the architectural differences of ARM and DSPs along with floating point capabilities.
- To explore architecture and functionality of various DSP Processors and can able to write programs.
- To known about the connectivity of interfacing devices with processors.

Course Outcomes: Upon completing this course, the student will be able to:

- Understand the various processing operations on Digital signals.
- Know the architecture of DSP Processors TMS320C54XX, ADSP 2100, 2181 and Blackfin Processor.
- Run the programs on DSP Processors.
- Interface Memory and I/O devices with DSP Processors.

UNIT –I

Fundamentals of Digital Signal Processing: Digital signal-processing system, Sampling process, Discrete time sequences, Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and Interpolation, Computational Accuracy in DSP Implementations- Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT –II

Architectures for Programmable DSP Devices: Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation UNIT, Programmability and Program Execution, Speed Issues, Features for External interfacing.

UNIT -III

Programmable Digital Signal Processors: Commercial Digital Signal-Processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline operation of TMS320C54XX Processors.

UNIT –IV

Analog Devices Family of DSP Devices: Analog Devices Family of DSP Devices – ALU and MAC block diagram, Shifter Instruction, Base Architecture of ADSP 2100, ADSP-2181 high performance Processor. Introduction to Blackfin Processor - The Blackfin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files, Address Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals

UNIT –V

Interfacing Memory and I/O Peripherals to Programmable DSP Devices: Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).

TEXT BOOKS:

1. Digital Signal Processing: Principles, Algorithms & Applications – J.G. Proakis & D.G. Manolakis, 4th Ed., PHI,2006.
2. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.

REFERENCES:

1. A Practical Approach to Digital Signal Processing - K Padmanabhan, R. Vijayarajeswaran, Ananthi. S, New Age International, 2009.
2. Digital Signal Processors, Architecture, Programming and Applications – B. Venkataramani and M. Bhaskar, TMH, 2002.
3. DSP Processor Fundamentals, Architectures & Features – Lapsley et al., S. Chand & Co. 2000.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- II SEMESTER
SYSTEMS AND SIGNAL PROCESSING

NEURAL NETWORKS & FUZZY SYSTEMS (PE - III)

Course Objectives:

- To cater the knowledge of Neural Networks and Fuzzy Logic Control and use these for controlling real time systems.
- To expose the students to the concepts of feed forward Neural Networks and about feedback Neural Networks
- To teach about the concepts of Fuzziness involved in various systems and comprehensive knowledge of Fuzzy logic control and to design the Fuzzy control

Course Outcomes: On successful completion of this course students should be able to:

- Understand the concepts of feed forward neural networks.
- Acquire adequate knowledge about feedback neural networks.
- Acquire the concept of fuzziness involved in various systems.
- Acquire knowledge about fuzzy set theory.

UNIT-I

Introduction to Neural Networks: Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate and- Fire Neuron Model, Spiking Neuron Model, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN.

UNIT- II

Essentials of Artificial Neural Networks: Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application Feed Forward Neural Networks Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Perceptron Convergence theorem, Limitations of the Perceptron Model, Applications.

UNIT- III

Multilayer Feed forward Neural Networks: Credit Assignment Problem, Generalized Delta Rule, Derivation of Backpropagation (BP) Training, Summary of Backpropagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements.

UNIT- IV

Associative Memories: Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory (Associative Matrix, Association Rules, Hamming Distance, The Linear Associator, Matrix Memories, Content Addressable Memory), Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function, Proof of BAM Stability Theorem Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis, Capacity of the Hopfield Network.

UNIT- V

Fuzzy Logic System: Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions. Fuzzification, Membership value assignment, development of rule base and decision-making system,

Defuzzification to crisp sets, Defuzzification methods. Applications Neural network applications: Process identification, Function Approximation, control and Process Monitoring, fault diagnosis and load forecasting. Fuzzy logic applications: Fuzzy logic control and Fuzzy classification.

TEXT BOOK:

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by | Rajasekharan and Rai PHI Publication.
2. Introduction to Artificial Neural Systems - Jacek M. Zuarda, Jaico Publishing House, 1997.

REFERENCE BOOKS:

1. Neural and Fuzzy Systems: Foundation, Architectures and Applications, - N. Yadaiah and S. BapiRaju, Pearson Education.
2. Neural Networks JamesA Freeman and Davis Skapura, Pearson, 2002.
3. Neural Networks SimonHykins , Pearson Education
4. Neural Engineering by C. Eliasmith and CH. Anderson, PHI
5. 5.Neural Networks and Fuzzy Logic System by Bork Kosko, PHI Publications

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- II SEMESTER
SYSTEMS AND SIGNAL PROCESSING

RADAR SIGNAL PROCESSING (PE - III)

UNIT - I

A Preview of Basic Radar Signal Processing, Radar Literature, Signal Models, components of a Radar Signal, Amplitude Models, clutter, Noise Model and Signal -to -Noise Ratio, Jamming, Frequency Models-The Doppler Shift, Spatial Models, Spectral Model

UNIT - II

Sampling and Quantization of Pulsed Radar Signals, Domains and Criteria for Sampling Radar Signals, Sampling in the Fast Time Dimension, Sampling in Slow Time – Selecting the Pulse Repetition Interval, Sampling the Doppler Spectrum, Sampling in the Spatial and Angle Dimensions, Quantization, I/Q Imbalance and Digital I/Q

UNIT - III

Doppler Processing, Alternate Forms of the Doppler Spectrum, Moving Target Indication (MTI), Pulse Doppler Processing, Pulse Pair Processing, Additional Doppler Processing Issues, Clutter Mapping and the Moving Target Detector, MTI for moving plateforms

UNIT - IV

Introduction to Synthetic Aperture Imaging, Introduction to SAR Fundamentals, Stripmap SAR Data Characteristics, Stripmap SAR Image Formation Algorithms, Spotlight SAR Data Characteristics, the Polar Format Image Formation Algorithm for Spotlight SAR, Interferometric SAR

UNIT - V

Introduction to Beamforming and Space-Time Adaptive Processing- Spatial Filtering, Space-Time Signal Environment, Space Time Signal Modeling, Processing the Space Time Signal, Computational Issues in STAP, Reduce – Dimension STAP, Advanced STAP Algorithms and Analysis, Limitations to STAP

TEXT BOOKS:

1. Mark A. Richards, “Fundamentals of Radar Signal Processing”, McGraw Hill
2. Fred E. Nathanson, “Radar Design Principles: Signal Processing and The Environment”, 2nd Edition, 1999, PHI.
3. M.I. Skolnik, “Introduction to Radar Systems”, 3rd Edition, 2001, TMH.

REFERENCE BOOKS:

1. Peyton Z. Peebles, Jr., “Radar Principles”, 2004, John Wiley.
2. R. Nitzberg, “Radar Signal Processing and Adaptive Systems”, 1999, Artech House.
3. F.E. Nathanson, “Radar Design Principles”, 1st Edition, 1969, McGraw Hill.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.TECH.- I YEAR- II SEMESTER
SYSTEMS AND SIGNAL PROCESSING

DEEP LEARNING (PE - III)

Course Objectives:

- Introduce to the basic concepts of neural networks.
- Identify and analyze the various types of neural networks and models of neuron and apply accordingly.
- Introduce the concept of deep learning and its types.
- Explore the concepts of applications of deep learning.

Course Outcomes: Upon completing this course students will be able to:

- Analyze and apply the basic the concepts of neural networks
- Analyze various types of neural networks and use various activation functions to solve complex problems.
- Relate the concept of deep learning and its architecture.
- Design and carry out empirical analysis for various types of applications of deep learning systems.

UNIT- I

INTRODUCTION TO NEURAL NETWORKS: Characteristics of Neural Networks, Historical Development of Neural Networks Principles, Artificial Neural Networks: Terminology, Models of Neuron, Topology, Basic Learning Laws, Pattern Recognition Problem, Basic Functional Units, Pattern Recognition Tasks by the Functional Units. Introduction, Analysis of pattern Association Networks, Analysis of Pattern Classification Networks, Analysis of pattern storage Networks. Analysis of Pattern Mapping Networks.

UNIT – II

Feedback Neural Networks: Introduction, Analysis of Linear Auto associative FF Networks, Analysis of Pattern Storage Networks. Competitive Learning Neural Networks & Complex pattern Recognition Introduction, Analysis of Pattern Clustering Networks, Analysis of Feature Mapping Networks, Associative Memory.

UNIT- III

Fundamentals of Deep Learning: Defining Deep Learning, Common architectural principles of Deep Networks, Building Blocks of Deep Networks, and Major architectures of Deep Networks: Unsupervised Pretrained Networks, Convolution Neural Networks (CNNs), Recurrent Neural Networks.

UNIT- IV

Convolution Neural Networks: The convolution operation, motivation, pooling, Convolution and Pooling as an Infinitely Strong Prior, Applications of deep learning: Large scale deep learning, Computer vision, Speech Recognition, Natural Processing, other applications.

UNIT - V

Sequential Modelling: Recurrent neural networks: Recursive neural networks, The long short –term Memory, explicit memory, Auto encoders: Under complete, regularised, Stochastic Encoders and Decoders, Denoising Auto encoders

TEXT BOOKS:

1. Artificial Neural Networks B. Yagna Narayana, PHI. (Chapter 1,2 and 3)
2. Deep Learning: A Practitioner's Approach by Josh Patterson, Adam Gibson.
3. Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning." An MIT Press book in preparation. (2015)-http://www.deeplearningbook.org/

REFERENCES:

1. Neural Networks by Simon Haykin PHI
2. Deep learning (Adaptive computation &Machine learning) by Ian Good Fellow, Yoshua Bengio, Aran Courville.
3. Fundamentals of Neural Networks: Architectures, Algorithms and Applications, by Fausett.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.TECH.- I YEAR- II SEMESTER
SYSTEMS AND SIGNAL PROCESSING

SPEECH AND AUDIO SIGNAL PROCESSING (PE - IV)

Prerequisite: Advanced Digital Signal Processing

Course Objectives: The objectives of this course are to make the student

- Understand the anatomy and Physiology of Speech Production system
- To analyze the speech in time domain and extract various time domain parameters
- To study various Speech Signal Processing applications viz: Speech Enhancement, Speech Recognition, Speaker Recognition.
- To study various Audio coding techniques based on perceptual modeling of the human ear.

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

- Model an electrical equivalent of Speech Production system.
- Extract the LPC coefficients that can be used to Synthesize or compress the speech.
- Design a Homomorphic Vocoder for coding and decoding of speech.
- Understand the concepts of Speech and Speaker Recognition systems.
- Design basic audio coding methods for audio signal.

UNIT – I

Fundamentals of Digital Speech Processing: Anatomy & Physiology of Speech Organs, The Process of Speech Production, The Acoustic theory of speech production- Uniform lossless tube model, effect of losses in vocal tract, effect of radiation at lips, Digital models for speech signals.

Perception: Anatomical pathways from the Ear to the Perception of Sound, The Peripheral Auditory system, Hair Cell and Auditory Nerve Functions, Properties of the Auditory Nerve. Block schematics of the Peripheral Auditory system.

UNIT – II

Time Domain models for Speech Processing: Introduction – Window considerations, Short time energy, average magnitude, average zero crossing rate, Speech vs Silence discrimination using energy and zero crossing, pitch period estimation using a parallel processing approach, the short time autocorrelation function, average magnitude difference function, pitch period estimation using the autocorrelation function.

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, The Homomorphic Vocoder.

Speech Enhancement: Speech enhancement techniques: Single Microphone Approach, Spectral Subtraction, Enhancement by re-synthesis, Comb filter, Wiener filter, Multi Microphone Approach.

UNIT – IV

Automatic Speech Recognition: Basic pattern recognition approaches, parametric representation of Speech, Evaluating the similarity of Speech patterns, Isolated digit Recognition System, Continuous word Recognition system. Elements of HMM, Training & Testing of Speech using HMM.

Automatic Speaker Recognition: Recognition techniques, Features that distinguish speakers, MFCC, delta MFCC, Speaker Recognition Systems: Speaker Verification System, Speaker Identification System, Performance Metrics.

UNIT – V

Audio Coding: Lossless Audio Coding, Lossy Audio coding, Psychoacoustics, ISO-MPEG-1 Audio coding, MPEG - 2 Audio coding, MPEG - 2 Advanced Audio Coding, MPEG - 4 Audio Coding.

TEXT BOOKS:

1. Digital Processing of Speech Signals - L. R. Rabiner and S. W. Schafer. Pearson Education.
2. Digital Audio Signal Processing – Udo Zolzer, 2nd Edition, Wiley.

REFERNCES:

1. Discrete Time Speech Signal Processing: Principles and Practice - Thomas F. Quateri, 1st Ed., PE.
2. Digital Processing of Speech Signals. L. R Rabinar and R W Jhaung, PHI, 1978.
3. Speech Communications: Human & Machine - Douglas O'Shaughnessy, 2nd Ed., EEE Press.
4. Speech & Audio Signal Processing- Ben Gold & Nelson Morgan, 1st Ed., Wiley

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- II SEMESTER
SYSTEMS AND SIGNAL PROCESSING

NETWORK SECURITY AND CRYPTOGRAPHY (PE - IV)

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

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

UNIT-I:

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.

UNIT-III

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-IV

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-V

Authentication and System Security: 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, Secure Electronic Transaction Intruders, Intrusion Detection, Password Management, Worms, viruses, Trojans, Virus Countermeasures, Firewalls, Trusted Systems.

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

REFERENCES:

1. Christopher M. King, Ertem Osmanoglu, Curtis Dalton, "Security Architecture, Design Deployment and Operations", RSA Pres,
2. Stephen Northcutt, Leny Zeltser, 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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- II SEMESTER
SYSTEMS AND SIGNAL PROCESSING

WIRELESS COMMUNICATIONS AND NETWORKS (PE - IV)

Prerequisite: Digital Communications

Course objectives: The course objectives are:

- To provide the students with the fundamental treatment about many practical and theoretical concepts that forms basic of wireless communications.
- To equip the students with various kinds of wireless networks and its operations.
- To provide an analytical perspective on the design and analysis of the traditional and emerging wireless networks, and to discuss the nature of, and solution methods to, the fundamental problems in wireless networking.
- To train students to understand the architecture and operation of various wireless wide area networks such as GSM, IS-95, GPRS and SMS.

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

- Understand cellular system design concepts.
- Analyze various multiple access schemes used in wireless communication.
- Demonstrate wireless Local and Wide area networks and their specifications.
- Familiar with some of the existing and emerging wireless standards.
- Understand the concept of orthogonal frequency division multiplexing.

UNIT - I

The Cellular Concept-System Design Fundamentals: Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies- Prioritizing Handoffs, Practical Handoff Considerations, Interference and system capacity – Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference, Power Control for Reducing 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 prefect conductors, Ground Reflection (Two-Ray) Model, Diffraction-Fresnel Zone Geometry, Knife-edge Diffraction Model, Multiple knife-edge Diffraction, Scattering, Outdoor Propagation Models- Longley-Rice Model, Okumura Model, Hata Model, PCS Extension to Hata Model, Walfisch and Bertoni Model, Wideband PCS Microcell Model, Indoor Propagation Models-Partition losses (Same Floor), Partition losses between Floors, Log-distance path loss model, Ericsson Multiple Breakpoint Model, Attenuation Factor Model, Signal penetration into buildings, Ray Tracing and Site Specific Modeling.

UNIT – III

Mobile Radio Propagation: Small –Scale Fading and Multipath: Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel- Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading,

Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath Fading Channels-Clarke's model for flat fading, spectral shape due to Doppler spread in Clarke's model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.

UNIT - IV

Equalization and Diversity: Introduction, Fundamentals of Equalization, Training A Generic Adaptive Equalizer, Equalizers in a communication Receiver, Linear Equalizers, Non-linear Equalization-Decision Feedback Equalization (DFE), Maximum Likelihood Sequence Estimation (MLSE) Equalizer, Algorithms for adaptive equalization-Zero Forcing Algorithm, Least Mean Square Algorithm, Recursive least squares algorithm. Diversity 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, Hiper Lan, 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. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, 2002, PE
4. Mobile Cellular Communication – Gottapu Sasibhushana Rao, Pearson Education, 2012.

REFERENCES:

1. Wireless Digital Communications – Kamilo Feher, 1999, PHI.
2. Wireless Communication and Networking – William Stallings, 2003, PHI.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- II SEMESTER
SYSTEMS AND SIGNAL PROCESSING

ADAPTIVE SIGNAL PROCESSING LAB (Lab - III)

List of Experiments:

1. Real time signal enhancement using Adaptive Filter.
2. Representation of different Q-formats using GEL function.
3. Design and verification of Matched filter
4. Adaptive Noise Cancellation using Simulink
5. Cancellation of echoes in long distance telephone circuits
6. Design of Adaptive linear combiner
7. Design and measure the different phases in Adaptive Beam forming.
8. Verify the LMS algorithm
9. Verify the RLS Algorithm
10. Design a kalman filter

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- II SEMESTER
SYSTEMS AND SIGNAL PROCESSING

DIGITAL SIGNAL PROCESSORS AND ARCHITECTURES LAB (Lab – IV)

Experiments to be carried out on DSP C6713 (or equivalent) evaluation kits and using Code Composer Studio (CCS)

List of Experiments:

1. To study the architecture of DSP chip TMS 320 CSA /Instructions
2. To develop an assembly code and C code to compute Euclidian distance between any two points
3. 2. To develop assembly code and study the impact of parallel, serial and mixed execution
4. 3. To develop assembly and C code for implementation of convolution operation
5. 4. To design and implement filters in C to enhance the features of given input sequence/signal
6. To verify the circular convolution
7. To design FIR filter (LP/HP) using rectangular windowing technique
8. To design FIR filter (LP/HP) using triangular windowing technique
9. To design FIR filter (LP/HP) using Kaiser windowing technique
10. To design IIR filter (LP/HP) using windowing technique
11. N Point FFT algorithm

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- II YEAR- I SEMESTER
SYSTEMS AND SIGNAL PROCESSING

VLSI SIGNAL PROCESSING (PE - V)

Course Outcomes: On successful completion of the module, students will be able to:

- Ability to modify the existing or new DSP architectures suitable for VLSI.
- Understand the concepts of folding and unfolding algorithms and applications.
- Ability to implement fast convolution algorithms.
- Low power design aspects of processors for signal processing and wireless applications.

UNIT -I

Introduction to DSP: Typical DSP algorithms, DSP algorithms benefits, Representation of DSP algorithms

Pipelining and Parallel Processing: Introduction, Pipelining of FIR Digital filters, Parallel Processing, Pipelining and Parallel Processing for Low Power

Retiming: Introduction, Definitions and Properties, Solving System of Inequalities, Retiming Techniques

UNIT –II

Folding and Unfolding: Folding- Introduction, Folding Transform, Register minimization Techniques, Register minimization in folded architectures, folding of Multirate systems

Unfolding- Introduction, An Algorithm for Unfolding, Properties of Unfolding, critical Path, Unfolding and Retiming, Applications of Unfolding

UNIT -III

Systolic Architecture Design: Introduction, Systolic Array Design Methodology, FIR Systolic Arrays, Selection of Scheduling Vector, Matrix Multiplication and 2D Systolic Array Design, Systolic Design for Space Representations contain Delays.

UNIT -IV

Fast Convolution: Introduction – Cook-Toom Algorithm – Winogard algorithm – Iterated Convolution – Cyclic Convolution – Design of Fast Convolution algorithm by Inspection

UNIT -V

Low Power Design: Scaling Vs Power Consumption, Power Analysis, Power Reduction techniques, Power Estimation Approaches

Programmable DSP: Evaluation of Programmable Digital Signal Processors, DSP Processors for Mobile and Wireless Communications, Processors for Multimedia Signal Processing

TEXT BOOKS:

1. VLSI Digital Signal Processing- System Design and Implementation – Keshab K. Parthi, Wiley Inter Science, 1998.
2. VLSI and Modern Signal processing – Kung S. Y, H. J. While House, T. Kailath, Prentice Hall, 1985.

REFERENCES:

1. Design of Analog – Digital VLSI Circuits for Telecommunications and Signal Processing – Jose E. France, Yannis Tsividis, Prentice Hall, 1994.
2. VLSI Digital Signal Processing – Medisetti V. K, IEEE Press (NY), 1995.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- II YEAR- I SEMESTER
SYSTEMS AND SIGNAL PROCESSING

IOT AND ITS APPLICATIONS (PE - V)

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

- Understand the concept of IOT and M2M
- Study IOT architecture and applications in various fields
- Study the security and privacy issues in IOT.

UNIT- I

IoT & Web Technology The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.

UNIT- II

M2M to IoT – A Basic Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.

UNIT- III

IoT Architecture -State of the Art – Introduction, State of the art, Architecture Reference Model-Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture-Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.

UNIT- IV

IoT Applications for Value Creations Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management, eHealth.

UNIT- V

Internet of Things Privacy, Security and Governance Introduction, Overview of Governance, Privacy and Security Issues,

TEXT BOOKS:

1. Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014.
2. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013.
3. Cuno Pfister, “Getting Started with the Internet of Things”, O Reilly Media, 2011.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- II YEAR- I SEMESTER
SYSTEMS AND SIGNAL PROCESSING

SMART ANTENNA AND ARRAY SIGNAL PROCESSING (PE - V)

UNIT – I

Introduction to Smart Antennas: Need for Smart Antennas, Smart Antenna Configurations, Architecture of a Smart Antenna System, Benefits and Drawbacks, Space division multiple access (SDMA).

UNIT – II

Beamforming Methods: Classical beamformer- signal model, Conventional beamformer, null steering, optimization using reference signal, Direct matrix inversion, maximum SNR beamformer, Tapped delay line structure, digital beam forming, frequency domain processing.

UNIT – III

Adaptive Processing: Least Mean Squares Algorithm, Structured Gradient Algorithm, Recursive Least Mean Squares Algorithm, Improved Least Mean Squares Algorithm, Recursive Least Squares Algorithm, Constant Modulus Algorithm, Conjugate Gradient Method, Adaptive Beam Space Processing, Signal Sensitivity of Constrained Least Mean Squares Algorithm.

UNIT – IV

DOA estimation methods: The array response vector, received signal model, signal autocovariance matrices, conventional DOA estimation methods, conventional beamforming method, spectral estimation methods, minimum variance distortion less response estimator, Capon's minimum variance method, subspace approach to DOA estimation, the MUSIC algorithm, the ESPRIT algorithm.

UNIT – V

Diversity Combining: Selection combiner, Switched diversity combiner, Equal gain combiner, Maximum ratio combiner, RAKE receiver, Mobile station's Smart Antennas.

TEXT BOOKS:

1. Constantine A Balanis, Panayiotis Antennas, Morgan & Claypool Publishers
2. Lal Chand Godara, Smart Antennas, CRC Press.
3. Ahmed El Zooghby, Smart Antenna Engineering, Artech House.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech. (SYSTEMS AND SIGNAL PROCESSING)

ENGLISH FOR RESEARCH PAPER WRITING (Audit Course - I & II)

Prerequisite: None

Course objectives: Students will be able to:

- Understand that how to improve your writing skills and level of readability
- Learn about what to write in each section
- Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

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.

UNIT-IV:
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-V:
skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions. useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

TEXT BOOKS/ 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's book.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech. (SYSTEMS AND SIGNAL PROCESSING)

DISASTER MANAGEMENT (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to

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

UNIT-I:
Introduction:
Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.
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-II:
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-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.

TEXT BOOKS/ 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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech. (SYSTEMS AND SIGNAL PROCESSING)

SANSKRIT FOR TECHNICAL KNOWLEDGE (Audit Course - I & II)

Prerequisite: None

Course Objectives:

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

Course Outcomes: Students will be able to

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

UNIT-I:
Alphabets in Sanskrit,

UNIT-II:
Past/Present/Future Tense, 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

TEXT BOOKS/ REFERENCES:

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech. (SYSTEMS AND SIGNAL PROCESSING)

VALUE EDUCATION (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to

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

Course outcomes: Students will be able to

- Knowledge of self-development
- Learn the importance of Human values
- 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 judgements

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.

UNIT-IV:
Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature

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

TEXT BOOKS/ REFERENCES:

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech. (SYSTEMS AND SIGNAL PROCESSING)

CONSTITUTION OF INDIA (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to:

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

Course Outcomes: Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- 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.
- Discuss the passage of the Hindu Code Bill of 1956.

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, Qualification, 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. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

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

TEXT BOOKS/ 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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech. (SYSTEMS AND SIGNAL PROCESSING)

PEDAGOGY STUDIES (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to:

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

Course Outcomes: Students will be able to understand:

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

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 indepth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the scho 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.

TEXT BOOKS/ 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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech. (**SYSTEMS AND SIGNAL PROCESSING**)

STRESS MANAGEMENT BY YOGA (Audit Course - I & II)

Prerequisite: None

Course Objectives:

- To achieve overall health of body and mind
- To overcome stress

Course Outcomes: Students will be able to:

- Develop healthy mind in a healthy body thus improving social health also
- Improve efficiency

UNIT-I:
Definitions of Eight parts of yog. (Ashtanga)

UNIT-II:
Yam and Niyam.

UNIT-III:
Do`s and Don't's in life.
i) Ahinsa, satya, astheya, bramhacharya and aparigraha
ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT-IV:
Asan and Pranayam

UNIT-V:
i) Various yog poses and their benefits for mind & body
ii) Regularization of breathing techniques and its effects-Types of pranayam

TEXT BOOKS/ REFERENCES:

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech. (SYSTEMS AND SIGNAL PROCESSING)

PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS
(Audit Course - I & II)

Prerequisite: None

Course Objectives:

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

Course Outcomes: Students will be able to

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

UNIT-I:

Neetisatakam-Holistic development of personality

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)

UNIT-II:

Neetisatakam-Holistic development of personality

- Verses- 52,53,59 (dont's)
- Verses- 71,73,75,78 (do's)

UNIT-III:

Approach to day to day work and duties.

- Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
- Chapter 18-Verses 45, 46, 48.

UNIT-IV:

Statements of basic knowledge.

- Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18
- Personality of Role model. Shrimad Bhagwad Geeta:

UNIT-V:

- Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
- Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37,38,63

TEXT BOOKS/ REFERENCES:

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