DC– 11 REPRESENTATION AND ANALYSIS OF RANDOM SIGNALS

1. **Random variable,** distribution functions and probability densities - Expected value and moments of random variables - coefficient of variation, skewness and kurtosis - of random variables conditional mean and variance - moment generating function - Characteristics function – Cumulants – probability generating function.

2. **Discrete random variables and their distributions**- Binomial, Negative Binomial, Hyper geometric and multinomial distributions- Poisson distribution- Relationship between distributions of various Discrete type random variables.

3. **Continuous random variables and their distributions-** Normal, Log-normal, multivariate normal distribution- Gamma, Exponential, Chi-square, Weibull, and Rayleigh distributions- Relationship between distributions of various continuous type random variables.

4. **Transformation of single random variable**- Transformation of several random variables- function of random variables- Sum, difference, product and ratio of random variables- Transformation through characteristic functions.

5. **Stochastic processes-** classification- Stationary processes- Ergodic processes- Independent increment processes- Markov processes- counting processes- Narrow-band process- Stochastic processes for analysis of physical phenomena Normal(Gaussian), Weiner- Levy, Poisson Bernoulli and shot noise processes- Auto correlation function.

TEXT BOOKS:

Michel K. Ochi, Applied Probability and Stochastic Processes in Engineering and Physical Sciences, Wiley,
1992.

REFERENCE BOOKS:

A. Papoulis, Probability, Random variables and Stochastic Processes, McGraw Hill, 1985. Kishore.S.Trivedi,
Probability and Statistics with Reliability, Queuing and Computer Science applications, Prentice Hall, 1982.

DC–12 DIGITAL COMMUNICATION

1. Base Band and Band pass transmission

Base Band transmission- wave form representation of Binary digits - PCM, DM, ADM system.
Detection of binary signals in Gaussian noise - Matched filter - Application of matched filter – Error probability performance of binary signaling - Multilevel base band transmission - Intersymbol interference - compandor- A law and law detectors.
Digital modulation techniques- PSK, APSK, FSK, & ASK, Detection of signals in noise- correlation receiver - Coherent and non coherent detection PSK & FSK - Error performance of binary system - comparison of bit error performance of binary system - M-ary signaling - Vectorial view of MPSK and MFSK- error performance.

2. Channel Coding

Waveform coding- types of coding- Convolutional Coding, Interleaving and commercial telephone modem, Trellis Coded modulation.

3. Synchronization

Receiver Synchronization, coherent systems- symbol and frame, Synchronization network, Synchronization- Open and closed loop systems.

4. Spread spectrum

Spread spectrum techniques- Spreading techniques- PN sequences- Direct Sequence Spread spectrum system- Frequency hopping system- Examples- Fast and slow hopping- Demodulation schemes
Synchronization- Tracking and Acquisitions.

5. Encryption and Decryption

Model Encrypter- Decrypter, Cipher system Stream data encryption, standard stream encryption, Public key encryption system.

TEXT BOOKS:

Simon Haykin, Digital communication, John Wiley, 1988.

REFERENCE BOOKS:

Taub and Schilling, Principles of Digitals Communication System, Mc Graw Hillm 1986.
Bruce Carlson, Principles of Digitals Communication, McGraw Hill, 1988.
R.F.Ziemer and W.H.Tramter, Principles of Digital Communication, Jaico publishing house, 1993.

DC–13 INFORMATION THEORY AND CODING

1. Information and Channel Capacity

Measure of Information- Information content of message - Average Information Content(Entropy) of Symbols in long independent sequences - Markow statistical model for information sources – Entropy and information rate of morkow sources - Channel capacity theorem- Some properties.

2. Source encoding

Shannon's first fundamental theorem - Noiseless coding - Source with finite memory - Shannon's second fundamental theorem on coding for memory less noise channels- Shannon's encoding algorithm.

3. Discrete communication Channels

Discrete communication channels- Rate of information transmission over a discrete channel- Capacity of discrete memoryless channels- Discrete Channels with memory- Discrete channels with continuous noise- Discrete channel with discrete noise**.**

4. Continuous communication channels

Continuous channels- Shannon- Hartley Theorem implication- Continuous channel with Continuous noise- Efficiencies of different communication system.

5. Error correcting codes

Galois fields, Vector spaces and Matrices- Block codes, Binary cyclic codes- Multiple Error correcting codes- Majority logic decoding- Convolution codes- Burst error correcting codes- Two Dimensional codes- ARQ-performance of Codes.

TEXT BOOK:

J.Das, S.K.Mullick, P.K.Chatterjee, Principles of Digital Communication, Wiley Eastern Limited,
1986.

REFERENCE BOOKS:

K.Sam Shanmugam, Digital and Analog Communication System, John Wiely & Sons, 1985.
A.J.Viterbi and J.K.Omura, Principles of Digital Communication and Coding, McGraw Hill.

DC–14 ADVANCED DIGITAL SIGNALS PROCESSING

1. Modelling of filters

Power spectrum sample random filter, model of first order Markov process-parameter Identification Linear prediction and signal modeling, minimal phase signals and filters, minimum delay property, spectral factorization theorem.

2. Linear estimation

Linear estimation of signals stationary, Wiener filter as Kalman filter, Construction of Wiener filter least as Kalman filter, Construction of wiener filter as Kalman filter.

3. Linear prediction

Auto representative model levenson recursion – Analysis and synthesis of lattice filters, Schur algorithm –FIR wiener filter, Least square wave shaping and spiking filters.

4. Spectrum estimation

Spectrum estimation by auto regressive modeling, spectral analysis of sinusoids in noise, Maximum likehood method, Spatial smoothing.

5. Adaptive filters

Adaptive implementation of Wiener filter – Adaptive linear combiner –Adaptive FIR Wiener filter- Adaptive Channel equalizer- Adaptive echo cancellers- Adaptive noise canceling- Adaptive linear prediction.

TEXT BOOKS:

Sophoclas J Orfanidis, Optimum Signal Processing, McGraw Hill, 1990.
J. G. Proakis, C. M. Rader, F. Ling and C. L. Nikis, Advanced Digital Signal Processing Maxwell Macmillan International Edition, 1992.
J. V. Candy, Signal Processing, McGraw Hill, New York, 1986.

REFERENCE BOOKS

B. Mulgrew and Colin F. N. Cowan, Adaptiv Filters & Equalisers, Kuluwer Academic Publishers, Boston, 1998.
J. V. Candy, Signal Processing, McGraw Hill, New York, 1986.