

## 2<sup>nd</sup> Semester

### DIGITAL SIGNAL PROCESSING AND ITS APPLICATIONS DC 551

Discrete Time signals - sequences, representation

Discrete Time Systems – Linear, Time invariant, LTI System, properties, constant – coefficient difference equation.

Frequency Domain Representation of discrete time signals & systems

Discrete – Time Random Signals

Z Transform – properties, R.O.C, stability, Causality criterion.

Inverse Z- Transform , Recursive and Non recursive systems, Realization of discrete time system.

D.F.T – properties, linear and circular convolution

Discrete Cosine transform, relationship between DFT & DCT.

I.D.F.T , computation of D.F.T : F.F.T – Decimation in time & Decimation in frequency.

F.I.R and I.I.R Systems : Basic structure of FIR & IIR, Bilinear transformation, Design of discrete time I.I.R filters – Butterworth, Chebychev, Inv. Chebychev, elliptic etc.

Design of F.I.R filters by windowing – rectangular, Bartlett, Hann, Hamming, Kaiser window filter , Design method , Relationship of Kaiser to other windows.

Application of MATLAB for design of digital filters

Effect of finite register length in filter design.

Advanced signal processing techniques and transforms: Multirate Signal processing – Down sampling/upsampling, Int. to discrete Hilbert transform, wavelet transform, Haar transform etc.

Application of DSP to Speech Signal Processing.

#### **Books:**

1. A.V Oppenheim and R.W Schaffer, “Discrete – Time signal processing” (2<sup>nd</sup> edition) , Prentice Hall
2. S. Mitra “Digital Signal Processing using MATLAB”, 2<sup>nd</sup> Edition.
3. Proakis, “Int. to Digital Signal Processing”, Maxwell Mcmillan.

## **INFORMATION THEORY AND CODING DC 552**

Information theory: Marginal , joint and conditional entropy, information rate ,mutual information, channel capacity of various channels , Cascaded channels , repetition of signals

Shannon's theorem, Shannon – Hartley theorem, BW-S/N ratio trade off, continuous channel, negative entropy.

Coding : Irreducibility, separability, coding efficiency , source encoding, Shannon- Fano code, Huffman code, Data compression.

Channel encoding – minimum distance, error detection and correction, FEC and ARQ, block code, convolutional codes, cyclic codes, signal error correction, multiple error correction, Burst error correction, Cryptography, Encryption, Decryption.

### **Books:**

1. Information theory : F.M Reza, McGraw Hill
2. Digital and Analog Communication Systems: K.Sam Shanmugam, John Wiley
3. Communication Systems : Analog and Digital : Singh & Sapre, TMH, 1995.
4. Digital Communication: B. Sklar, Pearson Education Asia.

## **MODERN TELEPHONE SWITCHING SYSTEMS**

### **DC 553**

Electronic space Division switching :- Stored program control (SPC), switching matrices, multistage switching, enhance services photonic switching.

Time Division switching: - Time division space, and time switching, multiplexed switching, combination switching, T-S, T-S-T, switching n-stage combination switching, PBX switching, PBX networking, digital PBX.

Traffic Engg. : - Traffic load , Grade of service, Erlang's formulas, blocking modeling switching systems, Blocking model.

Subscriber Loop, Dialing Systems :- Switching hierarchy & routing, Transmission plan, numbering plan, charging plan, signaling technique.

Local Access Techniques :- Digital subscriber lines, DSL, ADSL etc, WLL, FIL, wireless for local telephone services.

Integrated services digital network: the concept of ISDN, ISDN interfaces and End-user applications, ISDN architecture.

#### **Books :**

1. Telecomm. Switching systems & networks- Thairajan PHI
2. Comm. System – Taub & Schilling, Mc Graw Hill
3. Telecomm. & the Computers - James Martin – PHI
4. The Essential Guide to Telecomm – Pearson Educah- Annabelz Dodd.

## **COMPUTER COMMUNICATION**

### **DC 554**

Study of function TCP/IP ref. Model in computer networks. Switching techniques & Switches, Broad band ISDN & ATM. Polling techniques, multiplexing & concentration, LAN components, transmission media used in physical layer, X.25 networks.

Queuing theory, Max. Flow Algorithm, Introduction to LAN, WAN, LAN protocols, ALOHA, IEEE standards for LAN. High speed fiber optic networks, FDDI, SONET satellite networks, packets radio networks. Data link layer protocols, error detection & correction codes in DLL. Protocol performance evaluation, protocol specification & verification, Routing and congestion in network layer, routing & congestion control algorithms. Network layer in Internet and ATM networks. Network synchronization, traffic analysis, Network management in routing control.

Connection management in transport layer. Protocols of transport layer. Internet transport protocols like TCP, UDP etc. ATM protocols.

Data security & cryptography techniques, access management in application layer, World Wide Web, e-mail, concept of virtual terminals.

Study of different computer networks.

**Books:**

1. Computer Network, Tanenbaum, P.H..I publication.
2. Data and Computer Communication : William Stalling.
3. Computer and internet, by Comer, McGraw Hill.

**ELECTIVE – II: 1 NEURAL NETWORKS  
DC 561**

History of Artificial Neural Networks (ANN), Neuron models, Network architectures, Learning Processes.

Single layer and Multilayer perceptrons , Backpropagation Algorithm, Generalization, Function Approximations, Network pruning techniques.

Radial Basis Function (RBF) Networks, Regularization theory, Generalized RBF Networks, Estimation of the Regularization parameters, Approximation properties of RBF networks, Comparison of RBF and Multilayer perceptrons.

Recurrent Neural Networks, Computational power of recurrent neural networks, learning algorithms, backpropagation through time, Real time recurrent learning.

Engineering Applications of ANN, System identification, Adaptive filter design, solving interpolation and extrapolation problems using ANN, Classification, Function approximation and pattern recognition problems.

**Books :**

1. J.A. Freeman and B.M.Skapure, “Neural Networks, Algorithms Applications and programming Techniques”, Addison – Wesley, 1990
2. Laurence Fausett, “Fundamental of Nerual Networks: Architecture, algorithms and application”, Prentice Hall, 1994.

## **ELECTIVE – II: 2. MICROWAVE COMMUNICATION**

### **DC 562**

Microwave radio system: Transmitter & receivers block diagram , FM microwave repeater, diversity protection switching microwave terminal station, repeater station

Microwave links: Block diagram, path characteristics, system gain, free space path loss, S/N ratio.

Microwave sources: Vacuum tube & solid state devices , microwave modulators microwave amplifiers, transmitting & receiving antennas, microwave detectors.

Microwave components: waveguide, joints , Tees, frequency meters, attenuators, ferrite devices, direction couplers etc.

#### **Books:**

1. Advanced Electronic Comm System. W Tomasi , PHI, 1988
2. Electronic Comm. Systems II Edition Roy Blake Thomsar
3. Electronic Comm. Kemealy & Dakis TMH

## **ELECTIVE – II: 3. NANO TECHNOLOGY**

### **DC 563**

#### **Introduction**

Introduction to nanoscale systems. Length energy and time scales. Top down approach to Nano lithography. Spatial resolution of optical, deep ultraviolet, X-ray, electron beam and ion beam lithography. Single electron transistors, coulomb blockade effects in ultra small metallic tunnel junctions.

#### **Quantum Mechanics**

Quantum confinement of electrons in semiconductor nano structures. Two dimensional confinement ( Quantum wells), Band gap engineering, Epitaxy, Landauer, - Buttiker Formulism for conduction in confined geometries, one dimensional confinement, quantum point context, quantum dots and bottom of approach, introduction to quantum methods for information processing.

#### **Molecular Techniques**

Molecular Electronics, Chemical self assembly, carbon nano tubes, self assembled mono layers , Electomechanical techniques, Applications in biological and chemical detection, Atomic scales characterization techniques, scanning, tunneling microscopy, atomic force microscopy.

#### **Text:**

1. Beenaker and van Houten “Quantum Transport in Semiconductor Nanostructures in solid state Physics” Eherneich and Turnbull, Academic press, 1991

#### **References:**

1. David Ferry ” Transport in Nano structures” Cambridge University press 2000
1. Y.Imry “Introduction to Mesoscopic Physics, Oxford University press 1997

2. S. Dutta "electron Transport in Mesoscopic system" Cambridge University press 1995
3. H Grabert and M.Devoret single charge Tunneling" Plenum press 199