EE-471 DIGITAL SIGNAL PROCESSING

1. **Introduction:** Basic elements of digital signal processing, comparison of analog and digital signal processing, multi-channel and multi-dimensional signals, random and deterministic signals, FIR and IIR systems, recursive and non-recursive systems, correlation of discrete time signals.
2. **Discrete Fourier Transform and Fast Fourier Transform:** Frequency domain sampling and reconstruction of discrete time signals, DFT, DFT as linear transformation, frequency analysis of signals using DFT, properties of DFT, circular convolution, linear filtering methods based on DFT, overlap save and overlap add method, FFT algorithms, decimation in time and decimation in frequency algorithms, applications of FFT algorithms, linear filtering approach to computation of the DFT, Goertzel algorithm.
3. **Implementation of Discrete Time Systems:** Structures for the realization of LTI systems, recursive and non-recursive realization of FIR systems, structures for FIR systems, direct form, cascade form, frequency sampling and lattice structures, structures for IIR systems, direct form, signal flow graphs and transposed structure, cascade, parallel form and lattice structures.
4. **Design of FIR Digital Filters:** Introduction, LTI systems as frequency selective filters, Paley-Wiener theorem, characteristics of frequency selective filters, design of linear phase FIR filters, design of digital filters by placement of poles and zeros in z-plane, digital resonators, Notch filters, Comb filters and all pass filters, design of linear phase FIR filters using windows and by frequency sampling method.
5. **Design of IIR Digital Filters:** Introduction, design of IIR filters from their analog counterparts, design using approximation of derivatives, impulse invariance, bilinear transformation and matched z-transformation, frequency transformations in analog and digital domains, design of digital filters based on least squares method, design of IIR filters in frequency domain.

BOOKS:

1. Digital Signal Processing, Proakis and Manolakis
2. Theory and Application of Digital Signal Processing, Rabiner and Gold
3. Digital Signal Processing, Sanjit K. Mitra.
4. Digital Signal Processing, Oppenheim and Schafer

EE-472 ANALOG AND DIGITAL COMMUNICATION SYSTEMS

1. **Introduction to communications systems:** Communication process, sources of information, communication channels, base band and pass band signals, representation of signals and systems, switched communication systems.
2. **Continuous-wave modulation:** Amplitude modulation (AM), frequency spectrum of the AM wave, representation of AM, power relations in the AM wave., AM detector, vestigial side-band modulation.
3. **Angle Modulation:** Frequency spectrum of Frequency Modulation (FM) and Phase Modulation, generation of FM (direct and indirect method), demodulation of FM signal.
4. **Radio receiver:** Tuned Radio-Frequency (TRF) receiver, Super heterodyne receiver.
5. **Pulse Modulation:** Sampling process, Pulse Amplitude Modulation (PAM), Time Division Multiplexing (TDM), Frequency Division Multiplexing (FDM), Pulse Width Modulation (PWM), Pulse Position Modulation (PPM).
6. **Digital Modulation Techniques:** Quantization process, Pulse Code Modulation (PCM), Differential Pulse Code Modulation (DPCM), Delta Modulation (DM), Adaptive Delta Modulation, Amplitude –Shift Keying (ASK), Frequency-Shift Keying (FSK), Phase-Shift Keying (PSK).
7. **Advanced Communication Systems:** Computer communication system, satellite communications, mobile communication.

BOOKS:

1. Communication Systems, Simon Haykin
2. An Introduction to Analog and Digital Communications, Haykin
3. Principles of Communication Systems, H. Taub and D.L. Schilling
4. Electronic Communication Systems, George Kennedy
5. Principles of Communication Engineering, Anokh Singh

EE-474 HIGH VOLTAGE ENGINEERING

1. **Introduction:** Electric field stresses, liquid breakdown, solid breakdown, Estimation and control of Electric stress, Surge voltage, their distribution and control, electromagnetic field calculations in a single/multi dielectrics, geometric bodies and design aspects including field measurement techniques.
2. **Conduction and Breakdown in Gases:** Gases as insulating medium, Ionization Processes, equations criterion for breakdown, experimental determinations of ionization coefficient (Alfa, Gamma), streamer theory of breakdown in gases, Paschen's law, uniforms & non-uniform fields, corona discharges, practical consideration in using gases for insulation purposes and recent trends.
3. **Conduction and breakdown in liquid:** Liquids as insulators, pure liquids and commercial liquids, conduction and breakdown in pure liquids, cavitation & bubble theory, thermal mechanism, stressed oil volume theory, measurement of dielectric & chemical properties for power equipments, their significance and latest trends.
4. **Breakdown in solid dielectrics:** Introduction, intrinsic breakdown, electronic, electromechanical, thermal breakdown, breakdown of solid insulation in practices, breakdown phenomenon in composite insulation, solid dielectrics used in practice, dielectric/mechanical/chemical properties considerations, their significance and measurements.
5. **Generation of High Voltages and currents:** Generation of high voltage DC (HVDC), High alternating voltages (HVAC), generation of impulse voltages, components of modular integrated impulse, DC and AC equipments and their practical considerations.
6. **Measurement of High Voltages and Currents:** Measurement of high D.C. Voltage, HVAC and impulse voltages, sphere gap, various types of gaps resistance and capacitors potential divider crest voltmeters, electrostatic voltmeter, measurement of partial discharges & its significance.
7. **Over voltage phenomenon and insulation coordination in electric power systems:** Natural causes for over voltages lightning phenomenon, switching over voltages and power frequency over voltages in power systems, principles of insulation of high voltage and extra high voltage systems, surge diverters.

BOOKS:

1. High Voltage Engineering, M.S.Naidu and V.Kamaraju.
2. High Voltage Engineering, E.Kuffel and M. Alldullah.
3. High Voltage Trends, M.Chaurasia.
4 High Voltage Engineering, E.Kuffel and Zaengal.
5. High Voltage Test Techniques, Dieter Kind, Kurt Fesser.