

## EC 706(A): TELECOM TRANSMISSION & SWITCHING

Teaching Scheme			Examination Scheme							
Lect.	Pract	Total	Theory				Practical			Grand Total
			Int. Assess.	Sem End		Total	Int. Assess.	Sem End	Total	
Marks	Hrs									
3	2	5	30	70	3	100	25	25	50	150

### 1. Introduction:

Evolution of Telecommunications, Basic of switching System, Telecommunication transmission, digital Transmission, Four wire circuits, FDM, TDM, PDH, SDH. .PCM Transmission path & reception path, Transmission formats for 24-channel and 30-channel systems.

### 2. Evolution of Switching System:

Strowger, Rotary Dial Telephone, Signaling Tones, Step by Step Switching, Design Parameters, Crossbar Switching: Principal of Common Control, Touch Tone Dial Telephone, and Principals of Crossbar Switching, Digital Switching.

### 3. Electronic Space Division:

SPC, Distributed SPC, Software Stored Program Control, Centralized Architecture, Application Software, Enhanced Services, Two-Stage Networks, Three-Stage Networks, n-Stage Networks.

### 4. Time Division Switching:

Basic Time Division Space Switching, Basic Time Division Time Switching, Time Multiplexed Space Switching, Grade of Service, Non blocking Networks, Synchronization.

### 5. Control of Switching System:

Call processing function, Common Control, stored Program Control

### 6. Signaling Techniques:

In channel Signaling, Common Channel Signaling, Signaling Sytem-6 (SS6), Signaling System-7 (SS7).

### 7. Traffic Engineering:

Network Traffic Load and Parameters Grade of Service and Blocking Probability, Modeling switching Systems, Incoming Traffic and Service Time Characterizations, Blocking Models and Loss Estimates, Delay Systems, Traffic Measurement, Lost call System, Queuing System.

### 8. Telecom Networks:

Introduction, Analog Networks, Integrated Digital Networks, Integrated services Digital Networks, Cellular radio Networks, Intelligent Networks, Private Networks, Numbering, National Schemes, International Numbering, Numbering Plan for the ISDN , Public Data Networks, Charging, Routing, General, Automatic alternative routing, Numbering, Network Management, IN, VPN, B-ISDN Telecommunications Network, Management.

### 9. Management Platforms:

The Well-designed Platform system, Methods and tools, Standards and platform building blocks.

### 10. Management of Personal communication systems

Managing Mobile Networks – from cellular to satellite networks.

### **11. Digital and analogue microwave radio systems:**

System protection, FM analogue microwave radio, Digital microwave radio - transceiver, low capacity and high capacity.

#### **Reference Books:**

1. Telecommunication Switching Systems and Networks By Viswanathan (PHI).
2. Telecommunication Switching Traffic and Network By J.E.Flood (Pearson Education).
3. Telecommunication Transmission Systems By Robert G. Winch, (MGH).
4. Introduction to Telecommunication Voice, Data, Internet By Wayne Tomasi, (PHI).
5. Mobile Cellular Telecommunication By William C. Y. Lee, (Mc Graw Hill).
6. Digital Telephony, By John C. Bella (John wiley & Sons).

## EC 706(B) : DIGITAL IMAGE PROCESSING

Teaching Scheme			Examination Scheme							
Lect.	Pract	Total	Theory				Practical			Grand Total
			Int. Assess.	Sem End		Total	Int. Assess.	Sem End	Total	
Marks	Hrs									
3	2	5	30	70	3	100	25	25	50	150

### 1. Introduction:

Background; digital image representation; fundamental steps in image processing; elements of digital image processing systems: image acquisition, storage, processing, communication and display.

### 2. Digital image fundamentals:

Structure of the human eye; image formation; brightness adaptation and discrimination; a simple image model; uniform and non-uniform sampling and quantization; some basic relationships between pixels; neighbors of a pixel; connectivity; Labeling. Relations; equivalence and transitive closure; distance measures; imaging geometry; basic transformations; perspective transformations; camera model and calibration; stereo imaging; photographic film structure and exposure; film characteristics; diaphragm and shutter settings; characteristic of CCD imaging systems.

### 3. Image transforms:

The discrete Fourier transform; properties of 2-D Fourier transform; reparability, translation, periodicity, conjugate symmetry; rotation, distributives and scaling; average value; Laplacian; convolution and correlation; sampling. FFT algorithm; number of operations; IFFT; implementation; selected examples of other separable image transforms.

### 4. Image enhancement:

Spatial and frequency domain methods; enhancement by point processing; some simple intensity transformations; histogram processing; image subtraction; image averaging; smoothing and sharpening filters. Enhancement in frequency domain with lowpass, highpass and homomorphic filtering. Generation of spatial masks from frequency domain specifications. Colour image processing: colour fundamentals; colour models; pseudo-colour and full-colour image processing.

### 5. Image restoration:

Degradation model for continuous functions; discrete formulation; diagonalization of circulant and block-circulant matrices; unconstrained and constrained restoration; inverse filtering; formulation; removal of blur caused by uniform linear motion. Least mean square (Wiener) filter; interactive restoration; restoration in spatial domain; spatial transformations; gray-level interpolation.

### 6. Image compression:

Coding; interpixel, psycho-visual redundancy; fidelity criteria. Image compression models: source and channel encoding-decoding. Error free compression: variable length coding; bit-plane coding; lossless predictive coding. Lossy compression: lossy predictive coding; transform coding. Binary and continuous tone image compression standards.

## 7. Image segmentation:

Point, line, edge and combined detection. Edge linking and boundary detection: local processing; global processing via Hough transform and graph-theoretic techniques. Thresholding: foundation; the role of illumination; simple global and optimal thresholding. Basic formulation of region-oriented segmentation, Spatial and frequency domain techniques for the use of motion in segmentation.

### Reference Books:

1. Digital Image Processing By Rafael C. Gonzalez and Richard E. Woods, (Addison-Wesley)
2. Digital Image Processing By Castleman K.R., ( Prentice Hall )
3. Digital Image Processing By Pratt W.K. ( Wiley-Interscience)
4. Fundamentals of Digital Image Processing By A.K. Jain, (Prentice Hall of India)
5. Digital Image Processing And Analysis By Chandn And Majumdar, ( Prentice Hall of India)

Image representation - Gray scale and colour Images, image sampling and quantization.

Two dimensional orthogonal transforms - DFT, FFT, WHT, Haar transform, KLT, DCT.

Image enhancement - filters in spatial and frequency domains, histogram-based processing, homomorphic filtering.

Edge detection - non parametric and model based approaches, LOG filters, localisation problem.

Image Restoration - PSF, circulant and block - circulant matrices, deconvolution, restoration using inverse filtering, Wiener filtering and maximum entropy-based methods.

Mathematical morphology - binary morphology, dilation, erosion, opening and closing, duality relations, gray scale morphology, applications such as hit-and-miss transform, thinning and shape decomposition.

Computer tomography - parallel beam projection, Radon transform, and its inverse, Back-projection operator, Fourier-slice theorem, CBP and FBP methods, ART, Fan beam projection.

Image communication - JPEG, MPEGs and H.26x standards, packet video, error concealment.

Image texture analysis - co-occurrence matrix, measures of textures, statistical models for textures.

Misc. topics such as - Hough Transform, boundary detection, chain coding, and segmentation, thresholding methods.

### Texts/References

- A. K. Jain, Fundamentals of digital image processing, Prentice Hall of India, 1989.  
R.M. Haralick, and L.G. Shapiro, Computer and Robot Vision, Vol-1, Addison Wesley, Reading, MA, 1992.  
R. Jain, R. Kasturi and B.G. Schunck, Machine Vision, McGraw-Hill International Edition, 1995.  
W. K. Pratt, Digital image processing, Prentice Hall, 1989.  
A. Rosenfeld and A. C. Kak, Digital image processing, Vols. 1 and 2, Prentice Hall, 1986.  
H. C. Andrew and B. R. Hunt, Digital image restoration, Prentice Hall, 1977

## EC 706(C) : DIGITAL VOICE & PICTURE COMMUNICATION

Teaching Scheme			Examination Scheme							
Lect.	Pract	Total	Theory				Practical			Grand Total
			Int. Assess.	Sem End		Total	Int. Assess.	Sem End	Total	
				Marks	Hrs					
3	2	5	30	70	3	100	25	25	50	150

Digital speech communication; Digital TV communication; Characteristics of speech Signals; Characteristics of picture signals; Subjective and objective testing; Bit rates in Speech and picture communication CCITT recommendations for speech digitization; MPEG; HDTV, Low resolution TV and Videoconferencing requirements; Time domain. Waveform coding of speech –PCM, DPCM, ADPCM, DM and subband coding; Frequency domain waveform coding of speech–LTC, ATC; Parameter coding of speech- channel, format and LPC vocoders, Coding of monochrome and colour video signals-Transform and Adaptive transform coding, subband coding, Vector quantization; Interframe and Hybrid coding; Delayed decision and run length coding; Effects of transmission errors; Audio and video conferencing; Video telephone.

### Reference Books:

1. Digital Pictures: Representation, compression and Standards By Arun N.Netravali and Barry G.Haskell (Springer Publishers)
2. Digital Speech Processing: Speech coding, Synthesis and Recognition By A Netaj Ince (Kluwer academic Publishers)
3. A practical Handbook of Speech coders By Randy G. Goldberg (CRC Publishers)
4. Digital speech: Coding for Low Bit Rate Communication BY Ahmet M. Kondoz (WiLey)