Solapur University, Solapur

Ph.D. Course Work

Electronics and Telecommunication Engineering

(Faculty of Engineering & Technology)

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Electronics & Telecommunication Engineering
(Faculty of Engineering & Technology)
Syllabus for Ph.D. Course Work

Sr. No	Subject	Examination Scheme Theory paper
1	Research Methodology & Information Communication Technology	100 Marks
2	Recent Trends in Electronics & Telecommunication Engineering	100 Marks
3	Modern Topics in Electronics & Telecommunication Engineering	100 Marks
4	Elective – Advanced Development in Electronics & Telecommunication Engineering	100 Marks

Elective –

1. **Advanced Development in wireless Communication & Coding Technique**
2. **Advanced Development in Signal Processing**
3. **Advanced Development in Image Processing**

Note – Candidate will select an elective in consultation with guide from any one of the following.

- *Electronics & Telecommunication Engineering*
- *Electronics Engineering*
- *Computer Science & Engg.*

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Paper II– Recent Trends in Electronics and Telecommunication Engineering

(Simulation with MATLAB)

Examination scheme:Theory paper: 100 marks (3 hrs duration)

Unit 1 – Intoduction to MATLAB

Mathematical Operations with Arrays, Function & Function Files, Nested Loops, 2 Dimentional & 3 Dimentional Plots

Unit 2- MATLAB Cell Arrays & Structures

Strings, Cell Arrays, Nesting of Cell Arrays, Creation of Structure, Structure of Structures, Arrays of Structure, Conversion of Cell Arrays to Structure, Control Statement

Unit 3 –Functions and GUI

Subfunctions, Function handler, Nested Functions, File Input Output Handling, Graphical User Interface (GUI), Components of GUI, Dialogue Box, File Dialogue Box, Graphics Features

Unit 4 – Communication System Simulation with MATLAB

Communication System Toolbox - Simulation Analysis of Communication Link, Exposure to GUI Feature in Communication Toolbox, Analog Modulation/ Demodulation, Digital Modulation/ Demodulation, Bit Error Rate, Signal To Noise Ratio, Signal Constellation

Unit 5 – Filters using MATLAB

Simulation of IIR , FIR Filters, Simulation of Digital Filters, Adaptive Filter, FDA Tool

Unit 6- Signal Processing Applications with MATLAB

Signal Processing toolbox – Transforms, Least Mean Square (MSE) Algorithm, Minimal Mean Square Error (MMSE) Algorithm, Maximum Likelihood (ML) Algorithm, Kalman Filter

References :

1. Contemporary Communication Systems using MATLAB, John G. Prokis, Masoud Salehi, Gerhard Bauch

2. Digital Signal Processing, A Computer Based Approach by Sanjit Mitra, 3rd edition, Mc Graw Hill Publication

, Brooks/Cole Cengage Learning, Second

Edition

 3. MATAB Programming by Y. Kirani Singh, B.B. Choudhary, PHI

4. Using MATLAB (User's Guide), Math Works Inc

5. MATLAB Communication Toolbox User's Guide, Math Works Inc

6. MATLAB Signal Processing Toolbox, User's Guide, Math Works Inc

7. MATLAB Filter Design Toolbox, User's Guide, Math Works Inc

8. MATLAB Web Site – http://www.mathworks.com

9. MATLAB Web Site – http://www.mathworks.com/ matlabcentral

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Paper III– Modern Topics in Electronics and Telecommunication Engineering

(Advances in Communication Engineering)

Examination scheme:Theory paper: 100 marks (3 hrs duration)

Unit 1 – Computer Communication Network

Layered computer Network architecture, TCP, UDP , IP, IPV4 and IPV6.

Unit 2- ATM (Asynchronous Transfer Mode)

General concept & operation, ATM Interface standard, ATM cells ,virtual connection & addressing, ATM adaptation layer, ATM convergence Technology , ATM v/s other Technologies & services.

Unit 3 – Wireless Transmission Fundamentals

Signals for conveying Information, Analog digital transmission, channel capacity, Transmission media, Multiplexing .

Unit 4 – Research Issues in wireless Networks.
Radio resource management, channel allocation, Error control and coding , congestion control , routing, addressing, network access control, mobility control, flow control, Qos management, Power management, Cross layer control , network modeling , traffic modeling, Simulation modeling.

Unit 5- Network Security Issues
Network attacks and security measures considerations, a model for Network security, firewalls, Encryption methods, Digital Signatures, E-mail security, Web Security VPN and Internet security

Unit 6 – multimedia communication

Introduction to various multimedia communication Techniques, Different types of multimedia information, Information representation Applications, Various files formats for multimedia and their applications BMP, PNG, TIFF, JPEG, DFX, AVI, MPEG Audio/ Video Standards.

References :

1. Computer Networks , Fourth Edition,-Andrew S. Tanenbaum.Prentice Hall Publication.

2. Data.and.Computer.Communications-William Stallings. pearson publication

3. Computer Communicaton & Networking Technologies by Micheal A. Gallo , William M. Hancoc, Cengage learning Publicaion.

4. Network Security Essentials by William stalling's , pearson publication

5. Wireless and mobile network concepts and protocols by Dr. Sunil Kumar S. Manvi: WILEY publication.

6. Wireless Digital Communications modulator & spread spectrum applications by Dr. Kamilo Feher, Person Education.

7. Wireless communication and Networks. William Stallings, person education

8. Multimedia Communications by Fred Halsall, Prentice Hall.

9. Related IEEE/IEE publications.

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Paper IV– Elective I - Advanced Development in Wireless Communication & Coding Technique

Examination scheme:Theory paper: 100 marks (3 hrs duration)

Unit 1 - Introduction wireless network, differences between wireless and fixed telephone network, development of wireless network, wireless data services, traffic routing in wireless network,

Unit 2 - Wireless systems and standards, AMPS and ETCS,GSM, CDMA digital cellular standards, Reverse CDMA channel

Unit 3 - CT2 standard for Cordless telephone, Digital European Cordless standards, Personal communication systems

Unit 4 - Waveform coding, types of error control, structured sequences ,convolutional encoding , convolutional decoding algorithms

Unit 5 - Channel capacity, need of better codes, Turbo codes – encoding with interleaving, interleaver design, Turbo decoder, Trellis diagram.

Unit 6 - Modulation coding tadeoff

Modulation and coding for band limited channel, trellis coded modulation, serial and parallel concatenation of trellis coded modulation

References:

1. Wireless communications second edn. By Theodore S .Rappaport (Pearson)

2 . Digital communication by Bernard Sklar Second Edition Pearson Education

3 . Digital and Analog communication systemss by K. Sam Shanmugham

4. Mobile and Wireless communication Security by Bast Preneel

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Paper IV– Elective -II – Advanced Development in Signal Processing

Examination scheme:Theory paper: 100 marks (3 hrs duration)

Unit 1 – Introduction

Convolution, deconvolution, correlation, Probability Density Function, Power Spectrum Estimation, MMSE, criteria.

Unit 2 – Discrete Time Signal Processing

Discrete Fourier Transform, Inverse Discrete Fourier Transform, Discrete Cosine Transform, Inverse Discrete Cosine Transform, Orthogonal Transform, Discrete Wavelet Transform, Inverse Discrete Wavelet Transform.

Unit 3 – Optimum Linear Filter

Properties of Linear Prediction (Forward, Backward) error filter, Levinson's Durbin Algorithm, Wiener Filter, Weiner- Hopf equation, error performance, channel equalization.

Unit 4 –Speech Signal Processing

Short Time Speech Analysis, Time Domain Parameters, Frequency (Spectral) Domain Parameters, Spectral Estimation Methods, Nature of Interfering Sounds, Speech Enhancement Techniques, Spectral subtraction.

Unit 5 – Image Signal Processing

Fundamentals of Gray Scale and Colour Images, Image Acquisition, Image Transforms, Image Enhancement in Spatial and Frequency Domain, Noise Models, Segmentation.

References:

1. Digital Signal Processing Principles, Algorithms & applications by John Proakis & Dimirit Manolakis, 4th edition.
2. Adaptive Filter Theory by Simen Haykin, 3rd edition
3. L.R. Rabiner and R.E Schafer : Digital processing of speech signals, Prentice Hall.
4. Speech Communications Human & Machine by Douglas O'Shaughnessy, 2nd edition.
5. Digital Image Processing by R.C. Gonzalez, R.E. Woods, Pearson Education, 2nd edition.
6. IEEE Transactions on Signal Processing.

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Paper IV– Elective -III – Advanced Development in Image Processing

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Examination scheme:Theory paper: 100 marks (3 hrs duration)

Unit I- **Mathematics of Digital Images**: Vectors and matrices: Vectors and handedness, Matrices and determinants, Further products of vectors in 3-space, The matrix of a transformation, Permutations and the proof of Determinant Rules, Matrix algebra, Introduction to eigenvalues, Rank, and some ramifications, Similarity to a diagonal matrix, The Singular Value Decomposition (SVD)

Unit II – **Basics of Image and Image Processing**: Pixels and relationship, Image enhancement in spatial and frequency domain, Image Restoration, Fourier and wavelet transforms. Color Image Processing: Introduction to terminologies in CIP, Color Spaces and color Distances, Color Image Formation

Unit III- **Color Image Enhancement**: Color image enhancement, Edge detection in color image, Color image segmentation.

Unit IV – **Texture**: Statistical texture descriptors, syntactic texture descriptors, hybrid texture description methods, texture recognition method applications

Unit V- **Image Analysis**: Patterns and pattern classes, Recognition based on decision theoretic methods.

Unit VI - **Image Processing Applications with MATLAB:** Image Processing Toolbox- features, functions for reading, writing and displaying images, transforms, filters, analysis, enhancement. **Applications: (a)**Adaptive Noise Filtering using Back Propagation, Neural Network, Approach, M-file for Noise Filtering Using ANN, Program Illustration, **(b)** Binary Image Rotation Using Transformation Matrix, Algorithm, M-program for Binary Image Rotation with 45 Degree, Anticlockwise Direction, **(c)** Clustering Texture Images Using K-means Algorithm, Approach, M-program for Texture Images Clustering.

References:
1. Digital Image Processing, By Rafael C. Gonzalez, Richard E. Woods, Pearson Education, second / Third Edition
2. Digital Image Processing using MATLAB, By Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, Pearson
3.Digital Color image processing, By Andreas Koschan ,Mongi Abidi, WILEY international publication.
4. Pattern classification, By Duda, Hart, stock, 2nd Edition.
5. Mathematics of Digital Images: Creation, Compression, Restoration, Recognition, By S. G. HOGGAR, *University of Glasgow, Cambridge University Press 2006.*
6. Algorithm Collections for Digital Signal Processing Applications Using MATLAB, by E.S. Gopi, *National Institute of Technology, Tiruchi, India*, Published by Springer.