# SREE VIDYANIKETHAN ENGINEERING COLLEGE

(Autonomous)

Sree Sainath Nagar, A. Rangampet-517 102

## Department of Electronics and communication Engineering

### Lesson Plan

**Name of the Subject:** Advanced Digital Signal Processing, (14MT15706)

**Class & Semester:** M. Tech.– I Semester, VLSI (Elective-I) & CMS

**Name of the faculty Member:** Ms D Leela Rani

| S. No. | Topic | No. of periods | Book(s) followed | Topics for self study |
|---|---|---|---|---|
| | **UNIT – I: MULTIRATE FILTER BANKS** | | | |
| 1. | Decimation | 1 | T1 | Discrete Wavelet Transform |
| 2. | Interpolation | 1 | T1 | |
| 3. | Sampling rate conversion by a rational factor I/D | 1 | T1 | |
| 4. | Multistage Implementation of sampling rate conversion. | 1 | T1 | |
| 5. | **Digital Filter Banks**: Two-Channel Quadrature-Mirror Filter Bank, | 1 | T1 | |
| 6. | Elimination of aliasing, condition for Perfect Reconstruction, | 2 | T1 | |
| 7. | Polyphase form of QMF bank, | 2 | T1 | |
| 8. | Linear phase FIR QMF bank, IIR QMF bank , | 1 | T1 | |
| 9. | Perfect Reconstruction Two-Channel FIR QMF Bank | 2 | T1 | |
| | **Total periods required:** | **12** | | |
| | **UNIT II: NON-PARAMETRIC METHODS OF POWER SPECTRAL ESTIMATION** | | | |
| 10. | Estimation of spectra from finite duration observation of signals | 2 | T1 | Correlation, Power Spectrum and its properties |
| 11. | **Non-Parametric Methods**: Bartlett, Welch methods. | 2 | T1 | |
| 12. | Blackmann & Tukey methods. | 2 | T1 | |
| 13. | Performance Characteristics of Nonparametric Power Spectrum Estimators | 2 | T1 | |
| 14. | Computational Requirements of Nonparametric Power Spectrum Estimates | 2 | T1 | |
| | **Total periods required:** | **10** | | |
| | **UNIT -III: PARAMETRIC METHODS OF POWER SPECTRAL ESTIMATION** | | | |
| 15. | Autocorrelation & Its Properties | 2 | T1 | Stationary, Non-Stationary &Wide sense stationary processes |
| 16. | Relation between auto correlation and model parameters | 2 | T1 | |
| 17. | Yule-Walker & Burg Methods | 2 | T1 | |
| 18. | MA model for power spectrum estimation | 2 | T1 | |
| 19. | ARMA model for power spectrum estimation | 2 | T1 | |
| | **Total periods required:** | **10** | | |
| | **UNIT – IV: DSP ALGORITHMS** | | | |
| 20. | Fast DFT algorithms based on Index mapping | 2 | T2 | Composite FFT |
| 21. | Sliding Discrete Fourier Transform | 2 | T2 | |
| 22. | DFT Computation Over a narrow Frequency Band | 2 | T2 | |
| 23. | Split Radix FFT | 2 | T2 | |

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|---|---|---|---|---|
| 24. | Linear filtering approach to Computation of DFT using Chirp Z-Transform | 2 | T2 | |
| | **Total periods required:** | **12** | | |
| | **UNIT – V: APPLICATIONS OF DIGITAL SIGNAL PROCESSING** | | | |
| 25. | Digital cellular mobile telephony | 1 | R1 | Subband coding of speech and audio signals, spectral analysis of random signals.<br><br>**Research Topics:** Methods to Minimize Finite Word Length Effect, Wavelets in Digital Filter Banks. Multirate signal Processing |
| 26. | Adaptive telephone echo cancellation | 1 | R1 | |
| 27. | High quality A/D conversion for digital Audio | 2 | R1 | |
| 28. | Efficient D/A conversion in compact hi-fi systems | 2 | R1 | |
| 29. | Acquisition of high quality data | 1 | R1 | |
| 30. | Multirate narrow band digital filtering | 2 | R1 | |
| 31. | High resolution narrowband spectral analysis | 2 | R1 | |
| | **Total periods required:** | **11** | | |
| | **Grand total periods required:** | **55** | | |

**TEXT BOOKS:**

T1. John G. Proakis, Dimitris G. Manolakis, *Digital signal processing, principles, Algorithms and applications,* Prentice Hall, 4th Edition, 2007.

T2. Sanjit K Mitra, "*Digital signal processing, A computer base approach",* McGraw-Hill Higher Education, 4th Edition, 2011.

**REFERENCE BOOKS:**

R1. Emmanuel C Ifeacher Barrie. W. Jervis, "*DSP - A Practical Approach*", Pearson Education, 2nd Edition, 2002.

R2. A.V. Oppenheim and R.W. Schaffer, "*Discrete Time Signal Processing",* PHI, 2nd Edition, 2006.

**Signature of the faculty Member framing the syllabus** **Signature of the Chairman (BOS)**

SREE VIDYANIKETHAN ENGINEERING COLLEGE
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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## Lesson Plan

**Name of the Subject:** COMPUTER NETWORKS(14MT13805)
**Name(s) of the faculty Member(s) framing syllabus:** Mr. R. Nagendra

**Class & Semester:** M. Tech I SEM.(DECS & CMS)

| S. No. | Topic | No. of periods | Book(s) followed | Topics for Self Study |
|---|---|---|---|---|
| **Unit I: Introduction to Computer Networks** | | | | |
| 1. | Data communications & Networking for Today's Enterprise | 1 | T1 | Client – Server model, Network components, Network standards and protocols. |
| 2. | Data Communications | 1 | T1 | |
| 3. | Network Edge | 1 | T3 | |
| 4. | Network core | 1 | T3 | |
| 5. | Internet | 1 | T1 | |
| 6. | OSI Reference model | 1 | T1 | |
| 7. | TCP/IP models | 1 | T1 | |
| 8. | HDLC | 2 | T1, T2 | |
| 9. | Point to Point Protocol (PPP) | 2 | T1, T2 | |
| | **Total periods required:** | **11** | | |
| **Unit II: Wired & Wireless LANs** | | | | |
| 10. | Ethernet | 1 | T2 | Multiple Access protocols |
| 11. | FastEthernet | 1 | T2 | |
| 12. | Gigabit Ethernet | 1 | | |
| 13. | WLANS – Architecture and Services, Applications | 1 | T1 | |
| 14. | IEEE 802.11 WLAN Standard – Physical Layer | 1 | T1 | |
| 15. | MAC Layer, Frame structure | 1 | T1, T3 | |
| 16. | IEEE 802.11 a, b, g, e and n standards | 1 | T1 | |
| 17. | Bluetooth | 2 | T2 | |
| 18. | WiMax features | 1 | T1 | |
| 19. | standards, protocols and utility | 1 | T1 | |
| 20. | Virtual LANs | 1 | T1 | |
| | **Total periods required:** | **12** | | |
| **Unit III: Advanced Network Architectures** | | | | |
| 21. | Circuit switching network - SONET/SDH | 2 | T1 | N-ISDN & B-ISDN Networks, X.25. |
| 22. | Virtual Circuit Networks – Frame Relay | 2 | T1 | |
| 23. | ATM architectures and services | 1 | T1 | |
| 24. | ATM Layer | 1 | T1 | |
| 25. | ATM Adaptation Layer | 1 | T1 | |
| 26. | Signaling Protocols – MPLS | 1 | T1 | |
| 27. | RSVP | 1 | T1 | |
| 28. | VPN architecture | 1 | T2 | |

| S. No. | Topic | No. of periods | Book(s) followed | Topics for Self Study |
|---|---|---|---|---|
| 29. | IP over ATM | 1 | T1, T2 | |
| 30. | Repeaters& Bridges | 1 | T2 | |
| 31. | Routers &Gateways | 1 | T2 | |
| **Total periods required:** | | **13** | | |
| **Unit IV:** | | | | |
| 32. | IPv6 protocol | 1 | T1, T2 | Internet protocol IPV4, P2P file sharing, Congestion control in circuit switching networks, Congestion Control in ATM |
| 33. | TCP | 1 | T1, T2 | |
| 34. | UDP | 1 | | |
| 35. | Congestion control in TCP | 1 | T1, T2 | |
| 36. | Socket programing with TCP and UDP | 1 | T3 | |
| 37. | Web and HTTP | 2 | T3 | |
| 38. | FTP | 1 | T3 | |
| 39. | Simple Mail Transfer Protocol | 1 | T3 | |
| 40. | Domain Name System | 1 | T3 | |
| 41. | Multimedia Applications – RTP | 1 | T1, T3 | |
| 42. | Voice Over IP. | 1 | T1, T2 | |
| **Total periods required:** | | **12** | | |
| **Unit V: Security in Computer Networks** | | | | |
| 43. | Simple Network Management Protocol | 1 | T2 | Routing algorithms in ATM/ TCP networks |
| 44. | Network security | 1 | T3 | |
| 45. | Cryptography – Symmetric Key Cryptography | 1 | T3 | |
| 46. | Public Key Encryption | 1 | T3 | |
| 47. | Firewalls – Packet filtering | 1 | T3 | |
| 48. | Application Gateway | 1 | T3 | |
| 49. | Digital Signature | 1 | T2 | |
| 50. | IP Sec. | 1 | T2 | |
| **Total periods required:** | | **08** | | |
| **Grand total periods required:** | | **56** | | |

**TEXT BOOKS:**


T1. William Stallings, “Data and Computer Communication”, 9th edition, Prentice hall, 2010

T2. Behrouz A. Forouzan, “Data Communications and Networking”, 4th Ed, Tata McGraw-Hill, New Delhi, 2006

T3. Jim Kurose, Keith Ross, “Computer Networking: A Top Down Approach”, 4th edition, Addison Wesley, July 2007.


**REFERENCE BOOKS:**


R1. Andrew S. Tanenbaum “Computer Networks”, 4th Edition, Pearson Education, 2008

R2. LEON-GARCIA, INDRA WIDJAJA, “Communication Networks – Fundamental concepts and Key architectures”, TMH, 2000


**Signature(s) of the faculty Member(s) framing the syllabus**

**Signature of the Chairman (BOS)**

# SREE VIDYANIKETHAN ENGINEERING COLLEGE
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## Department of Electronics and communication Engineering

## Lesson Plan

**Name of the Subject:** DIGITAL COMMUNICATION TECHNIQUES (14MT13802)
**Class & Semester:** M. Tech (DECS & CMS) – I Semester
**Name of the faculty Member:** M. Sivasubramanyam

| S. No. | Topic | No. of periods | Book(s) followed | Topics for self study |
|---|---|---|---|---|
| **UNIT – I: Characterization Of Communication Signals And Systems** | | | | |
| 1. | *Review of Random Variables and Processes* | 4 | T1 | Representation of Band-Pass Stationary Stochastic Processes, Representation of Biorthogonal Signals, Simplex Signals and Signal waveforms from binary codes |
| 2. | Representation of Band-Pass Signals | 1 | T1 | |
| 3. | Representation of Linear Band-Pass System, Response of a Band-Pass System to a Band-Pass Signal | 1 | T1 | |
| 4. | Signal Space Representations – Vector Space Concepts, Signal Space Concepts | 1 | T1 | |
| 5. | Orthogonal Expansion of Signals | 2 | T1 | |
| 6. | Representation of PAM Signals, Phase Modulated Signals | 1 | T1 | |
| 7. | Representation of QAM Signals, Multidimensional Signals, Orthogonal Multidimensional Signals | 1 | T1 | |
| 8. | Representation of Multidimensional Signals and Orthogonal Multidimensional Signals | 1 | T1 | |
| 9. | Power Spectra of Linearly Modulated Signals | 2 | T1 | |
| **Total periods required:** | | **10** | | |
| **UNIT – II: Digital Modulation Techniques** | | | | |
| 10. | Factors that Influence digital modulation techniques | 1 | T2 | Raised Cosine Roll off Filter, Gaussian Pulse-Shaping Filter, BFSK, M-ary FSK and OFDM. |
| 11. | Bandwidth and Power Spectral Density of Digital Signals | 1 | T2 | |
| 12. | Linear Modulation Techniques–Introduction, BPSK | 1 | T2 | |
| 13. | DPSK | 1 | T2 | |
| 14. | QPSK | 1 | T2 | |
| 15. | OQPSK, | 1 | T2 | |
| 16. | ∏/4 QPSK | 1 | T2 | |
| 17. | Constant envelope Modulation Techniques – Introduction, MSK | 1 | T2 | |
| 18. | GMSK | 1 | T2 | |
| 19. | Combined Linear and constant envelope modulation techniques – M-ary PSK | 1 | T2 | |
| 20. | M- ary QAM | 1 | T2 | |
| **Total periods required:** | | **11** | | |
| **UNIT -III: Optimum Receivers For Additive Gaussian Noise Channels** | | | | |
| 21. | Optimum receiver for signals corrupted by AWGN – Correlation Demodulator | 1 | T1 | Probability of M-ary Biorthogonal Signals, Simplex Signals and M-ary Binary-coded Signals, Comparison of Digital Modulation Method, Probability of Error for Envelope Detection of M-ary Orthogonal Signals and Correlated Binary Signals |
| 22. | Matched Filter Demodulator | 1 | T1 | |
| 23. | Optimum Detector | 1 | T1 | |
| 24. | Performance of the optimum Receiver for Memory less Modulation – Probability of Error for Binary Modulation | 1 | T1 | |
| 25. | Probability of Error for M-ary Orthogonal Signals | 1 | T1 | |
| 26. | Probability of Error for M-ary PAM | 1 | T1 | |
| 27. | Probability of Error for m-ary PSK | 1 | T1 | |

| S. No. | Topic | No. of periods | Book(s) followed | Topics for self study |
|---|---|---|---|---|
| 28. | Probability of Error for QAM | 1 | T1 | |
| 29. | Optimum Receiver for Signals with Random Phase in AWGN Channel – Optimum Receiver for Binary Signals | 1 | T1 | |
| 30. | Optimum Receiver for M-ary Orthogonal Signals | 1 | T1 | |
| **Total periods required:** | | **10** | | |
| **UNIT – IV: Spread Spectrum Techniques** | | | | |
| 31. | Introduction and Model of Spread Spectrum Digital Communication | 1 | T1 | Digital Cellular CDMA System Based on DS Spread spectrum, A CDMA System Based on FH Spread Spectrum Signals |
| 32. | Direct Sequence Spread Spectrum Digital Signals | 2 | T1 | |
| 33. | Processing Gain and Jamming Margin | 1 | T1 | |
| 34. | Applications of DS-Spread Spectrum Signals – Antijamming Application | 1 | T1 | |
| 35. | Low-Detectability Signal Transmission, Code Division Multiple Access | 1 | T1 | |
| 36. | Generation of PN-Sequences | 2 | T1 | |
| 37. | Frequency– Hopping Spread Spectrum Signals | 1 | T1 | |
| 38. | Other Types of Spread Spectrum Signals | 1 | T1 | |
| **Total periods required:** | | **10** | | |
| **UNIT – V: Detection Of Spread Spectrum Signals** | | | | |
| 39. | Coherent Direct-Sequence Receivers | 1 | T3 | Matched Filters with Acquisition-Aiding Waveforms **Research Area:** Spread Spectrum Communication System |
| 40. | Delay-Lock Loop Analysis | 1 | T3 | |
| 41. | Tau-Dither Loop and Non Coherent Carrier Tracking | 1 | T3 | |
| 42. | Non coherent Frequency-Hop Receiver | 1 | T3 | |
| 43. | Acquisition of Spread-Spectrum Signals | 1 | T3 | |
| 44. | Acquisition by Cell-By-Cell Searching | 1 | T3 | |
| 45. | Reduction of Acquisition Time – Acquisition with Matched Filters | 1 | T3 | |
| 46. | Matched filters for PN Sequences | 1 | T3 | |
| 47. | Matched Filters for Frequency-Hopped Signals | 1 | T3 | |
| **Total periods required:** | | **09** | | |
| **Grand total periods required:** | | **50** | | |

**TEXT BOOKS:**


T1. John G. Proakis, “DIGITAL COMMUNICATIONS”, McGraw Hill, 4th edition, 2001.
T2. Theodore S. Rappaport, “Wireless Communications”, Pearson Education, 2nd edition, 2002.
T3. George R. Cooper & Clare D. McGillem, “Modern Communication and Spread Spectrum”, McGraw-Hill Book Company, 1986.


**REFERENCE BOOKS:**


R1. Marvin K. Simon, Jim K Omura, Robert A. Scholtz & Barry K.Levit, “Spread Spectrum Communications”, Computer Science Press, 1995.
R2. J.Marvin, K.Simon, Sami. M.Hinedi and William C. Lindsey, “Digital Communication Techniques”, PHI, 2009.


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## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## Lesson Plan

**Name of the Subject: Linear Algebra (14MT13831)**
**Name of the faculty Member:**
**Class & Semester: M. Tech. I Semester (CMS & DECS)** **Section:** -

| S. No. | Topic | No. of periods required | Book(s) followed | Topics for self study |
|---|---|---|---|---|
| **Unit-I: VECTORS AND LINEAR EQUATIONS** | | | | |
| 1. | System of linear equations | 1 | T1,T2 | Gauss Elimination method |
| 2. | Vector equations | 1 | T1,T2 | |
| 3. | The matrix and vector equations AX=B and AX=0 | 2 | T1,T2 | |
| 4. | Solution sets of linear system | 2 | T1,T2 | |
| 5. | Linear combinations , Linear dependence and independence of vectors | 1 | T1,T2 | |
| 6. | Solutions of equations using LU decomposition | 2 | T1,T2 | |
| | Total of periods required: | **9** | | |
| **Unit-II: VECTOR SPACES AND LINEAR TRANSFORMATIONS** | | | | |
| 7. | Vector spaces and subspaces | 1 | T1,T2 | Change of basis |
| 8. | Null and column Spaces of a matrix | 1 | T1,T2 | |
| 9. | Bases, Coordinate systems | 1 | T1,T2 | |
| 10. | Dimension of a Vector Space | 1 | T1,T2 | |
| 11. | Linear transformation, Properties of linear transformations | 2 | T1,T2 | |
| 12. | Rank and Nullity | 2 | T1,T2 | |
| 13. | Matrix of linear transformations | 2 | T1,T2 | |
| | Total of periods required: | **10** | | |
| **Unit-III: INNER PRODUCT SPACES** | | | | |
| 14. | Inner product, Norm | 1 | T1,T2 | Sylvester's law of inertia, positive definiteness. |
| 15. | Inner product space, | 2 | T1,T2 | |
| 16. | Othrogonality | 1 | T1,T2 | |
| 17. | Orthogonal sets | 1 | T1,T2 | |
| 18. | Ortho normal basis | 2 | T1,T2 | |
| 19. | Orthogonal projections | 1 | T1,T2 | |
| 20. | Gram-Schmidt orthogonalisation process | 2 | T1,T2 | |
| | Total of periods required: | **10** | | |
| **Unit-IV: EIGEN VALUES AND EIGEN VECTORS** | | | | |
| 21. | Eigen Values and Eigen Vectors of a matrices | 2 | T1,T2 | Hermitian, skew Hermitian and Unitary matrices |
| 22. | Eigen Values and Eigen Vectors of linear transformations | 1 | T1,T2 | |

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|---|---|---|---|---|
| 23. | Eigen values and Eigen vectors of complex matrices | 2 | T1,T2 | Eigen filters |
| 24. | Diagonalisation, | 2 | T1,T2 | |
| 25. | Quadratic forms- Nature | 2 | T1,T2 | |
| 26. | Orthogonality of symmetric matrices | 1 | T1,T2 | |
| 27. | Singular value decomposition (SVD). | 2 | T1,T2 | |
| | Total of periods required: | **12** | | |
| **Unit-V: ENGINEERING APPLICATIONS OF LINEAR ALGEBRA** | | | | |
| 28. | Applications to Difference equations- Discrete-time signals | 3 | T1 | Network flows |
| 29. | Linear Independence in the space signals | 2 | T1 | |
| 30. | Applications to Decoupling a dynamical system | 3 | T1 | |
| 31. | Complex Eigen Values in Decoupling systems | 3 | T1 | |
| 32. | Applications of inner product spaces to Fourier Series Analysis. | 3 | T1 | |
| | Total of periods required: | **14** | | |
| | **Grand total of periods required:** | **55** | | |

**TEXT BOOKS:**


T1. David C. Lay, **Linear Algebra and its applications**, Fourth edition, Pearson education, India. (2014).

T2.Jim DeFramza and Dan Gagliardi **Introduction to Linear Algebra with applications,** The McGraw. Hill Companies, India. (2012)


**REFERENCE BOOKS:**


R1. Gilbert Strang, **Introduction to Linear Algebra**, Fourth edition, South Asian edition, Cambridge Press. (2009).

R2. Otto Bretscher , **Linear Algebra with applications**, Third edition, Pearson education, India. (2007)


**Signature of the faculty Member framing the syllabus**

**Signature of the Chairman (BOS)**

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## Department of Electronics and communication Engineering

## Lesson Plan

**Name of the Subject:** Optical Communications and Networks (14MT23808)
**Class & Semester:** M. Tech. (CMS) – I Semester & (DECS)-II Semester(Elective-II)
**Name of the faculty Member:** G.Madhavilatha

| S. No. | Topic | No. of periods | Book(s) followed | Topics for self study |
|---|---|---|---|---|
| | **UNIT – I:** | | | |
| 1. | Evolution of fiber types | 1 | T1 | Attenuation, Scattering losses, Fiber bend loss |
| 2. | Guiding properties of fibers , Cross talk between fibers | 1 | T1 | |
| 3. | Coupled modes and mode mixing | 1 | T1 | |
| 4. | Dispersion properties of fibers | 1 | T1 | |
| 5. | Nonlinear effects of optical fibers-SRS, SBS, intensity dependent refractive index | 2 | T1 | |
| 6. | Characterization of materials for fibers | 2 | T1 | |
| 7. | Fiber preform preparation - Soot deposition, MCVD | 1 | T1 | |
| 8. | fiber drawing and control, roles of coating and jacketing | 2 | T1 | |
| | **Total periods required:** | **11** | | |
| | **UNIT – II: OPTICAL CABLE DESIGN** | | | |
| 9. | Fiber design considerations-Fiber diameter, Cladding thickness, Low and high bit rate system | 2 | T1 | Fiber Mechanical characteristics |
| 10. | Design objectives and cable structures | 2 | T1 | |
| 11. | Fiber splicing- fiber end preparation, single fiber splices | 2 | T1 | |
| 12. | Array splices, measurement of splicing effects | 2 | T1 | |
| 13. | optical fiber connectors-The role of connectors, Connector alignment techniques | 2 | T1 | |
| | **Total periods required:** | **10** | | |

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|---|---|---|---|---|
| **UNIT -III: FIBER OPTIC COMPONENTS FOR COMMUNICATION & NETWORKING** | | | | |
| 14. | Couplers, Isolators and Circulators | 2 | T2 | Pump Sources for Raman Amplifiers, Wavelength converters- Interferometric Techniques |
| 15. | Multiplexers & filters- Bragg Gratings, Fabry-Perot Filters | 2 | T2 | |
| 16. | Mach-Zehnder Interferometers, Arrayed Waveguide Grating | 1 | T2 | |
| 17. | Acousto-Optic Tunable Filter, High Channel Count Multiplexer Architectures | 1 | T2 | |
| 18. | Optical Amplifiers- Erbium Doped Fiber amplifiers, Raman amplifiers | 2 | T2 | |
| 19. | Transmitters- LED, Lasers | 2 | T2 | |
| 20. | Direct and External Modulation | 1 | T2 | |
| 21. | Detectors- Photo detectors | 1 | T2 | |
| 22. | Optical Switches – Optical switch technologies | 1 | T2 | |
| 23. | Wavelength Converters –Optoelectronic Approach, Optical gating | 1 | T2 | |
| **Total periods required:** | | **14** | | |
| **UNIT -IV: MODULATION AND DEMODULATION** | | | | |
| 24. | Signal formats for Modulation, Subcarrier Modulation and Multiplexing | 1 | T2 | Capacity limits of optical fibers |
| 25. | Optical Modulations – Duobinary, Single Side Band and Multilevel Schemes, | 1 | T2 | |
| 26. | Demodulation- Ideal and Practical receivers | 1 | T2 | |
| 27. | Bit Error Rates | 2 | T2 | |
| 28. | Coherent Detection, Timing Recovery and Equalization | 2 | T2 | |
| 29. | Reed-Solomon Codes for Error Detection and Correction | 1 | T2 | |
| **Total periods required:** | | **8** | | |
| **UNIT –V: OPTICAL NETWORKS** | | | | |
| 30. | Access Networks - architecture overview, Enhanced HFC | 1 | T2 | Packaging and cabling of photonic components, broadcast OTDM networks. **Research Topic:** Coherent Optical Systems |
| 31. | Fiber to the curb(FTTC) | 2 | T2 | |
| 32. | Photonic packet switching | 1 | T2 | |
| 33. | OTDM-Bit, Packet Interleaving | 2 | T2 | |
| 34. | Optical AND gates | 1 | T2 | |
| 35. | Synchronization | 1 | T2 | |
| 36. | OTDM testbeds | 1 | T2 | |
| 37. | Deployment considerations- Designing the transmission layer using SDM, TDM, WDM, Unidirectional versus Bidirectional WDM systems. | 1 | T2 | |
| **Total periods required:** | | **10** | | |
| **Grand total periods required:** | | **53** | | |

**Text Books:**

T1: S.E.Miller, A.G.Chynoweth, *Optical Fiber Telecommunication,* 1979

T2: Rajiv Ramaswamy, Kumar N. Sivaranjan and Galen H.Sasaki,"*Optical Networks* ", Elsevier,Third edition,2010.

**Reference Books:**

R1. John. M. Senior, *"Optical fiber communications: Principles and Practice"*, Pearson, Third edition, 2010.

R2: Gerd Kaiser, *Optical Fiber Communication*, McGraw Hill.

**Signature of the faculty Member framing the syllabus**

**Signature of the Chairman (BOS)**

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## Department of Electronics and communication Engineering

## Lesson Plan

**Name of the Subject:** RF Circuit Design (14MT16101)
**Class & Semester:** M. Tech. (CMS) – I Semester
**Name of the faculty Member:** Dr. V. R. Anitha

| S. No. | Topic | No. of periods | Book(s) followed | Topics for self study |
|---|---|---|---|---|
| **UNIT – I: INTRODUCTION TO RF ELECTRONICS** | | | | |
| 1. | The Electromagnetic Spectrum | 1 | T1 | |
| 2. | Units and Physical Constants, Microwave bands | 1 | T1 | |
| 3. | RF behavior of Passive components | 2 | T1 | |
| 4. | Tuned resonant circuits | 1 | T1 | |
| 5. | Vectors, Inductors and Capacitors | 2 | T1 | |
| 6. | Voltage and Current in capacitor circuits | 1 | T1 | |
| 7. | Tuned RF / IF Transformers | 2 | T1 | |
| **Total periods required:** | | **10** | | |
| **UNIT – II: TRANSMISSION LINE ANALYSIS** | | | | |
| 8. | Examples of transmission lines | 1 | T1 | Parallel and Series Connections |
| 9. | Transmission line equations and Biasing | 1 | T1 | |
| 10. | Kirchoffs Voltage and current law representation, Traveling voltage and current waves | 1 | T1 | |
| 11. | General Impedance definition, lossless transmission line model | 1 | T1 | |
| 12. | Micro Strip Transmission Lines | 1 | T1 | |
| 13. | Special Termination Conditions | 2 | T1 | |
| 14. | sourced and Loaded Transmission Lines | 2 | T1 | |
| 15. | **Single And Multiport Networks**: The Smith Chart | 1 | T1 | |
| 16. | Interconnectivity networks | 1 | T1 | |
| 17. | Network properties and Applications | 1 | T1 | |
| 18. | Scattering Parameters | 2 | | |
| **Total periods required:** | | **14** | | |
| **UNIT -III: MATCHING AND BIASING NETWORKS** | | | | |
| 19. | Impedance matching using discrete components | 2 | T1 | Filter implementation and Coupled filters |
| 20. | Micro strip line matching networks | 1 | T1 | |
| 21. | Amplifier classes of Operation and | 1 | T1 | |

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|---|---|---|---|---|
| | Biasing networks | | | |
| 22. | **RF Passive & Active Components**: Filter Basics – Lumped filter design | 1 | T1 | |
| 23. | Distributed Filter Design, Diplexer Filters | 2 | T1 | |
| 24. | Crystal and Saw filters, Active Filters | 1 | T1 | |
| 25. | Tunable filters | 1 | T1 | |
| 26. | Power Combiners / Dividers: Directional Couplers | 1 | | |
| 27. | Hybrid Couplers, Isolators | 1 | T1 | |
| 28. | RF Diodes: BJTs, FETs, | 1 | T1 | |
| 29. | HEMTs and Models | 1 | T1 | |
| **Total periods required:** | | **13** | | |
| **UNIT – IV: RF TRANSISTOR AMPLIFIER DESIGN** | | | | |
| 30. | Characteristics of Amplifiers, Amplifier Circuit Configurations | 1 | T1 | Noise figure, VSWR, Gain |
| 31. | Amplifier Matching Basics, Distortion and noise products | 1 | T1 | |
| 32. | Stability Considerations | 1 | T1 | |
| 33. | Small Signal amplifier design | 1 | T1 | |
| 34. | Power amplifier design | 1 | T1 | |
| 35. | MMIC amplifiers | 1 | T1 | |
| 36. | Broadband High Power multistage amplifiers | 1 | T1 | |
| 37. | Low noise amplifiers | 1 | T1 | |
| 38. | VGA Amplifiers | 1 | T1 | |
| **Total periods required:** | | **09** | | |
| **UNIT – V: OSCILLATORS** | | | | |
| 39. | Oscillator basics, Low phase noise oscillator design | 1 | T1 | **Research Topics:** Design of RF Circuits for Wireless Communication Applications like Radars, Navigation, Military… |
| 40. | High frequency Oscillator configuration | 1 | T1 | |
| 41. | LC Oscillators, VCOs | 1 | T1 | |
| 42. | Crystal Oscillators, PLL Synthesizer | 2 | T1 | |
| 43. | Direct Digital Synthesizer | 1 | T1 | |
| 44. | **RF Mixers**: Basic characteristics of a mixer | 1 | T1 | |
| 45. | Active mixers | 1 | T1 | |
| 46. | Image Reject and Harmonic mixers | 1 | | |
| 47. | Frequency domain considerations | 2 | | |
| **Total periods required:** | | **11** | | |
| **Grand total periods required:** | | **57** | | |

**Text Books:**

T1: Reinhold Ludwing, Pavel Bretchko, “RF Circuit design: Theory and applications”, Pearson Education Asia Publication, New Delhi 2001.

T2: Devendra K. Misra, " Radio Frequency and Microwave Communication Circuits – Analysis and Design", Wiley Student Edition, John Wiley & Sons, 2nd edition, July 2004.

**Reference Books:**

R1: Mathew M.Radmangh, “Radio frequency and microwave electronics”, PE Asia Publication, 2001.

R2: Christopher Bowick, Cheryl Aljuni and John Biyler, “RF Circuit Design”, Elsevier Science, 2008.

R3: Joseph Carr, "Secrets of RF Design", Tata McGraw Hill Publications, 3rd Edition, 2004.

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Sree Sainath Nagar, A. Rangampet-517 102

## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

### Lesson Plan

**Name of the Subject: Research Methodology (14MT10310)**
**Name of the faculty Member:**
**Class & Semester: M. Tech. - I Semester** **Section:**

| S. No. | Topic | No. of periods required | Book(s) followed | Topics for self study |
|---|---|---|---|---|
| **Unit-I: Introduction to Research Methodology** | | | | |
| 1. | Research objective and Motivation | 1 | T1 | Problems encountered by researchers. |
| 2. | Types of Research –Descriptive vs Analytical,<br>Applied vs Fundamental, Quantitative vs Qualitative,<br>Conceptual vs Empirical | 1 | T1 | |
| 3. | Research Approaches | 1 | T1 | |
| 4. | Research and Scientific Methods | 1 | T1 | |
| 5. | Research Process | 2 | T1 | |
| 6. | Criteria of Good Research | 1 | T1 | |
| | Total of periods required: | **7** | | |
| **Unit-II: Research Problem and Design** | | | | |
| 7. | What is Research Problem? | 1 | T1 | Experimental designs. Developing research plan. |
| 8. | Selecting the Problem | 1 | T1 | |
| 9. | Necessity of Defining the Problem | 1 | T1 | |
| 10. | Techniques involved in Defining a Problem | 2 | T1 | |
| 11. | What is Research Design? Its need and features | 1 | T1 | |
| 12. | Important concepts of Research Design | 1 | T1 | |
| 13. | Designing Methods:<br>Research design in case of exploratory research studies,<br>Research design in case of descriptive and diagnostic research studies, Research design in case of hypothesis-testing research studies | 2 | T1 | |
| | Total of periods required: | **9** | | |
| **Unit-III: Data Collection, Analysis, and Hypothesis** | | | | |
| 14. | Collection of Primary Data:<br>Observation Method, Interview Method, Questionnaires, Schedules, Other Methods | 1 | T1 | Guidelines for constructing questionnaires and interviews. |
| 15. | Collection of Secondary Data | 1 | T1 | |
| 16. | Selection of Appropriate Method for Data Collection | 1 | T1 | |
| 17. | Processing Operations: Editing, Coding, Classification and Tabulation | 2 | T1 | |
| 18. | Types of Analysis | 1 | T1 | |
| 19. | What is Hypothesis? Basic Concepts of Testing Hypothesis: Null hypothesis and alternative hypothesis, Level of significance, | 2 | T1 | |

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|---|---|---|---|---|
| | Decision rule, Type I and Type II errors, Two-tailed and One-tailed tests | | | |
| 20. | Hypothesis Testing Procedure | 1 | T1 | |
| | Total of periods required: | **9** | | |
| **Unit-IV: Statistics in Research** | | | | |
| 21. | Review of Statistical Techniques: Mean, Median, Mode | 1 | T1 | Simple regression analysis. |
| 22. | Geometric Mean, Harmonic Mean, Variance, Standard Deviation | 1 | T1 | |
| 23. | Measure of Asymmetry | 1 | T1 | |
| 24. | Normal Distribution | 2 | | |
| 25. | Chi-Square as a Test for Comparing Variance | 1 | T1 | |
| 26. | Steps Involved in Applying Chi-Square Test | 1 | T1 | |
| 27. | Problems | 2 | | |
| | Total of periods required: | **9** | | |
| **Unit-V: Interpretation and Report Writing** | | | | |
| 28. | Interpretation: Meaning, Importance | 1 | T1 | Mechanics of writing research report. |
| 29. | Interpretation: Techniques and Precautions | 1 | T1 | |
| 30. | Report Writing: Significance and Different Steps | 2 | T1 | |
| 31. | Types of Reports | 1 | T1 | |
| 32. | Precautions in Report Writing | 1 | T1 | |
| | Total of periods required: | **6** | | |
| | **Grand total of periods required:** | **40** | | |

**Text Book:**

T1. C.R. Kothari, *Research Methodology: Methods and Techniques*, New Age International Publishers, New Delhi, 2nd Revised Edition, 2004.

**Reference Books:**

R1. Ranjit Kumar, *Research Methodology: A step-by-step guide for beginners*, Sage South Asia, 3rd ed., 2011.

R2. R. Panneerselvam, Research Methodology, PHI learning Pvt. Ltd., 2009

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## Department of Electronics and communication Engineering

## Lesson Plan

**Name of the Subject:** Satellite Communications (14MT16102)
**Class & Semester:** M. Tech. (CMS) – I Semester
**Name of the faculty Member:** Dr. N. Padmaja

| S. No. | Topic | No. of periods | Book(s) followed | Topics for self study |
|---|---|---|---|---|
| **UNIT – I: Satellite Orbits and Subsystems** | | | | |
| 1. | Overview of satellite communications, brief history satellite systems | 1 | T1 | Origin of Satellite systems around the world, existing satellite networks and their specific purpose and applications. |
| 2. | Orbital Mechanics, Look Angles determination | 2 | T1 | |
| 3. | Orbital perturbations, Apogee- perigee heights | 2 | T1 | |
| 4. | Geo stationary orbits -launching orbits, launch vehicles. | 1 | T1 | |
| 5. | Satellite Sub-Systems- Attitude and Orbit Control system | 1 | T1 | |
| 6. | TT&C subsystem | 1 | T1 | |
| 7. | Power systems, Communication subsystems | 2 | T1 | |
| 8. | Satellite Antenna Equipment | 1 | T1 | |
| **Total periods required:** | | **11** | | |
| **UNIT – II: Low Earth Orbit and Non-Geostationary Satellite Systems** | | | | |
| 9. | Introduction-Orbit Considerations, Equatorial Orbits, Inclined Orbits, Elliptical Orbits, Molniya Orbit | 2 | T1 | Sun synchronous orbits, Radiation Effects, Radiation Safety and Satellite Telephones |
| 10. | Coverage and Frequency Considerations, General Aspects, Frequency band | 2 | T1 | |
| 11. | Elevation Angle Considerations, Number of Beams Per Coverage, Off-Axis Scanning | 1 | T1 | |
| 12. | Determination of Optimum Orbital Altitude | 1 | T1 | |
| 13. | Projected NGSO System Customer Service Base-Delay and Throughput Considerations-System considerations | 1 | T1 | |
| 14. | Incremental Growth, Interim Operations, Replenish Operations | 1 | T1 | |
| 15. | Operational NGSO Constellation | 2 | T1 | |

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|---|---|---|---|---|
| | Designs, Ellipse, Global star, New ICO, Iridium, Orbcomn, Sky bridge, Teledesic | | | |
| | **Total periods required:** | **10** | | |
| **UNIT – IV: Efficient Techniques & Satellite Packet Communications** | | | | |
| 16. | **Demand Assignment Multiple Access** : The ERLANG B Formula | 1 | T2 | SPADE systems, Capacity search for DA-TDMA, Repacking on-going Calls, Problems on Traffic Intensity |
| 17. | Types of Demand Assignments-DAMA Characteristics | 1 | T2 | |
| 18. | Real-Time Frame Reconfiguration, Frame and Burst Structures for DA-TDMA | 2 | T2 | |
| 19. | DAMA Interfaces- SCPC-DAMA | 1 | T2 | |
| 20. | Digital Speech Interpolation. | 1 | T2 | |
| 21. | **Satellite Packet Communications**: Preliminaries-Message Transmission by FDMA | 1 | T2 | |
| 22. | The M/G/1 Queue-Message Transmission by TDMA | 1 | T2 | |
| 23. | Pure ALOHA: Satellite Packet Switching | 1 | T2 | |
| 24. | Slotted ALOHA-Packet Reservation | 1 | T2 | |
| 25. | Tree Algorithm | 1 | T2 | |
| | **Total periods required:** | **11** | | |
| **UNIT -IV: Satellite Spread Spectrum Communications** | | | | |
| 26. | Direct Sequence Spread Spectrum Systems, PN Sequence | 1 | T2 | Spread Spectrum Transmission and Reception, DS-SS CDMA Capacity and examples. |
| 27. | Error Rate Performance in Uniform Jamming and Pulsed Jamming | 2 | T2 | |
| 28. | Direct Sequence Code Division Multiple Access, | 2 | T2 | |
| 29. | Sequence-Synchronous DS-CDMA, Sequence-Asynchronous DS-CDMA | 1 | T2 | |
| 30. | Random Access DS-CDMA | 1 | T2 | |
| 31. | Frequency HOP Spread Spectrum Systems, Frequency HOP Code Division Multiple Access | 2 | T2 | |
| 32. | DS Acquisition and Synchronization | 1 | T2 | |
| 33. | FH Acquisition and Synchronization | 1 | T2 | |
| 34. | Satellite on Board Processing | 1 | T2 | |
| | **Total periods required:** | **12** | | |
| **UNIT – V: Satellite Applications** | | | | |
| 35. | **Very Small Aperture Terminal Networks**: VSAT Technologies | 1 | T2 | Overview of VSAT systems, Polling VSAT Networks, Radio and Satellite Navigation. **Research Topics:** Satellite and Radio Networks, Challenges |
| 36. | Network Configurations | 1 | T2 | |
| 37. | Multi-access and Networking , Network Error Control | 2 | T2 | |
| 38. | **Mobile Satellite Networks**: Operating Environment | 1 | T2 | |

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|---|---|---|---|---|
| 39. | MSAT Network Concept-CDMA MSAT Network- | 1 | T2 | in Earth-Satellite propagation. Quality of Service (QoS) management in heterogeneous telecommunications and satellite networks. |
| 40. | Statistics of Mobile Propagation. | 1 | T2 | |
| 41. | **Direct broadcast satellite television and radio**<br>C-band and ku-band home Satellite TV. | 1 | T1 | |
| 42. | Digital DBS TV, DBS-TV System Design. | 1 | T1 | |
| 43. | DBS-TV Link Budget, Error Control in Digital DBS-TV | 1 | T1 | |
| 44. | Master Control Station and Uplink Installation of DBS-TV Antennas-Satellite Radio Broadcasting | 1 | T1 | |
| **Total periods required:** | | **11** | | |
| **Grand total periods required:** | | **55** | | |

**Text Books:**

T1: Timothy Pratt, Charles Bostian, Jeremy Allnutt, *Satellite Communications,* John Wiley & Sons, 2nd Edition, 2003.

T2: Tri T. Ha, *Digital Satellite Communications,* McGraw-Hill, 2nd Edition, 1999.

**Reference Books:**

R1: Dennis Roddy, *Satellite Communications,* Tata McGraw-Hill Education Private Limited, 4th Edition, 2009.

R2: Wilbur L. Pritchard, H.G. Suyderhoud , Robert A.Nelson, *Satellite Communication Systems Engineering*, 2nd Edition, Pearson Publications, 2008.

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# SREE VIDYANIKETHAN ENGINEERING COLLEGE

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## Department of Electronics and communication Engineering

### Lesson Plan

**Name of the Subject:** Speech Processing (**14MT16103)**
**Class & Semester:** M. Tech. CMS- I Semester
**Name of the faculty Member:** Mr T V S Gowtham Prasad

| S. No. | Topic | No. of periods | Book(s) followed | Topics for self study |
|---|---|---|---|---|
| **UNIT – I: DIGITAL MODEL FOR THE SPEECH SIGNAL** | | | | |
| 1. | The mechanism of speech production | 1 | T1 | Lossless Tube models-wave propagation in concatenated lossless tubes, Relationship to digital filters. |
| 2. | acoustic phonetics | 1 | T1 | |
| 3. | The Acoustic theory of speech production- sound propagation | 1 | T1 | |
| 4. | uniform lossless tubes | 1 | T1 | |
| 5. | Effect of losses in the vocal tract | 1 | T1 | |
| 6. | Effect of radiation at the lips | 1 | T1 | |
| 7. | Vocal tract transfer functions for vowels | 1 | T1 | |
| 8. | the effect of nasal coupling | 2 | T1 | |
| 9. | Excitation of sound in the vocal tract | 2 | T1 | |
| 10. | Digital model for speech signals | 2 | T1 | |
| **Total periods required:** | | **13** | | |
| **UNIT – II: TIME DOMAIN MODELS FOR SPEECH PROCESSING** | | | | |
| 11. | Introduction,Window considerations | 1 | T1 | Digital representation of speech signals. Short Time analysis. |
| 12. | Short Time energy and average magnitude | 1 | T1 | |
| 13. | Short time average zero crossing rate | 1 | T1 | |
| 14. | Speech vs silence discrimination using Average energy and zero crossing | 1 | T1 | |
| 15. | Pitch period estimation using parallel processing approach | 1 | T1 | |
| 16. | The short time autocorrelation function | 1 | T1 | |
| 17. | The short time average magnitude difference | 2 | T1 | |

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| | function | | | |
| 18. | Pitch period estimation using the autocorrelation function. | 2 | T1 | |
| **Total periods required:** | | **10** | | |
| **UNIT -III: HOMOMORPHIC SPEECH PROCESSING** | | | | |
| 19. | Homomorphic systems for convolution – properties of the complex Cepstrum | 2 | T1 | - |
| 20. | computational considerations | 1 | T1 | |
| 21. | The complex Cepstrum of speech | 1 | T1 | |
| 22. | pitch detection | 2 | T1 | |
| 23. | formant estimation, | 2 | T1 | |
| 24. | Homomorphic vocoder | 1 | T1 | |
| **Total periods required:** | | **9** | | |
| **UNIT – IV: LINEAR PREDICTIVE CODING OF SPEECH** | | | | |
| 25. | Basic principles of linear predictive analysis – Auto correlation method | 2 | T1 | Lattice formulation and solution. prediction error signals. Relationship between LPC analysis with Lossless tubes. |
| 26. | The covariance method | 1 | T1 | |
| 27. | Computation of the gain for the model | 1 | T1 | |
| 28. | solution of LPC Equations – Cholesky Decomposition | 1 | T1 | |
| 29. | solution for the covariance method. | 1 | T1 | |
| 30. | Durbin's Recursive solution for the autocorrelation equations. | 2 | T1 | |
| 31. | Comparision between methods of solutions of LPC analysis equations | 1 | T1 | |
| 32. | Applications of LPC parameters – Pitch detection using LPC parameters | 1 | T1 | |
| 33. | Formant analysis using LPC parameters. | 1 | T1 | |
| **Total periods required:** | | **12** | | |
| **UNIT – V: SPEECH AND SPEAKER RECOGNITION SYSTEMS** | | | | |
| 34. | Speaker recognition system- speaker verification system | 2 | T1 | Voice response systems.<br>Research Topics:<br>Text to Speech synthesis, Analysis of Speech signal parameters. |
| 35. | speaker identification systems. | 2 | T1 | |
| 36. | Speech recognition system- isolated digit recognition system, | 2 | T1 | |
| 37. | continuous digit recognition system, | 1 | T1 | |
| 38. | LPC distance measure | 1 | T1 | |
| **Total periods required:** | | **08** | | |
| **Grand total periods required:** | | **52** | | |

**TEXT BOOKS:**


1. L R Rabiner and SW Schafer, " Digital processing of speech signals", pearson education, 2006.
2. LR Rabiner ,BH Juang, B Yegnanarayana, " Fundamentals of Speech Recognition", pearson Education, 1993.


**REFERENCE BOOKS:**


1. Thomas F Quateri, "Discrete time speech signal processing", pearson edition, 2006.
2. Ben Gold & Nelson Morgan, "Speech & audio signal processing", wiley, 2006.
3. Douglas o shaughnessy , " Speech Communications", 2nd Edition , Oxford university press, 2000.


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# SREE VIDYANIKETHAN ENGINEERING COLLEGE

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## Department of Electronics and communication Engineering

### Lesson Plan

**Name of the Subject:** Transform Techniques (14MT13808)
**Class & Semester:** M. Tech. (CMS & DECS) – I Semester
**Name of the faculty Member:** Mr. K. V Koteswara Rao

| S. No. | Topic | No. of periods | Book(s) followed | Topics for self study |
|---|---|---|---|---|
| **UNIT – I** | | | | |
| 1. | **Review of Transforms**: Vector space, functions and function spaces | 1 | T2 | Parseval's Identity for the CWT, Inverse CWT as a many-to-One Operation. |
| 2. | Fourier transform | 2 | T2 | |
| 3. | Short-Time Fourier Transform | 2 | T2 | |
| 4. | Walsh, Hadamard, Haar | 1 | R1 | |
| 5. | Slant, KLT, Hilbert transforms | 1 | R1 | |
| 6. | **Continuous Wavelet Transform:** Introduction, Continuous-Time Wavelets | 1 | T1 | |
| 7. | Definition of the CWT | 1 | T1 | |
| 8. | The CWT as a correlation | 1 | T1 | |
| 9. | Constant Q-Factor Filtering Interpretation and Time-Frequency Resolution | 2 | T1 | |
| 10. | The CWT as an operator | 1 | T1 | |
| 11. | Inverse CWT | 1 | T1 | |
| **Total periods required:** | | **14** | | |
| **UNIT -II: DISCRETE WAVELET TRANSFORM AND ORTHOGONAL WAVELET DECOMPOSITION** | | | | |
| 12. | Introduction | 1 | T1 | Regularity and convergence, Band limited Bi-orthogonal Decomposition, Design and Selection of Wavelets. |
| 13. | Approximations of vectors in nested linear vector spaces | 1 | T1 | |
| 14. | Example of an MRA-Bases for the Approximation Subspaces and Harr Scaling Function | 2 | T1 | |
| 15. | Bases for the Detail Subspaces and Harr Wavelet | 2 | T1 | |
| 16. | Digital Filter Implementation of the Harr Wavelet Decomposition | 2 | T1 | |
| **Total periods required:** | | **08** | | |
| **UNIT -III: MRA ORTHONORMAL WAVELETS, AND THEIR RELATIONSHIP TO FILTER BANKS** | | | | |
| 17. | Introduction | 1 | T1 | Daubechies construction of Orthonormal Scaling |
| 18. | Formal Definition of an MRA | 1 | T1 | |
| 19. | Construction of a General Orthonormal | 2 | T1 | |

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| | MRA | | | Functions. |
| 20. | A Wavelet basis for MRA | 2 | T1 | |
| 21. | Digital Filtering Interpretation | 1 | T1 | |
| 22. | Examples of Orthogonal Basis Generating Wavelets | 1 | T1 | |
| 23. | Interpreting Orthonormal MRAs for Discrete time signals | 2 | T1 | |
| 24. | Miscellaneous issues Related to PRQMF Filter Banks | 1 | T1 | |
| 25. | Generating Scaling Functions and Wavelets from Filter Coefficients | 1 | T1 | |
| **Total periods required:** | | **12** | | |
| **UNIT – IV: ALTERNATIVE WAVELET REPRESENTATIONS** | | | | |
| 26. | Bi-orthogonal Wavelet Bases | 2 | T1 | M-Band Wavelets, Lifting Scheme. |
| 27. | Filtering Relationship for Bi-orthogonal Filters | 1 | T1 | |
| 28. | Examples of Bi-orthogonal Scaling Functions and Wavelets | 1 | T1 | |
| 29. | Two-Dimensional Wavelets | 2 | T1 | |
| 30. | Non-separable Multidimensional Wavelets | 1 | T1 | |
| 31. | Wavelet Packets | 2 | T1 | |
| **Total periods required:** | | **09** | | |
| **UNIT – V: APPLICATIONS OF WAVELETS** | | | | |
| 32. | Wavelet De-noising | 2 | T1 | Wavelets in Boundary Value Problems. **Research Topics:** Adaptive Wavelet Transforms, Stationary Wavelet Transforms, Cycle Wavelet Transforms. |
| 33. | Speckle Removal | 1 | T1 | |
| 34. | Edge Detection and Object Isolation | 2 | T1 | |
| 35. | Image Fusion | 2 | T1 | |
| 36. | Object Detection by Wavelet Transforms of Projections | 1 | T1 | |
| 37. | Scaling Functions as signaling pulses | 2 | T1 | |
| 38. | Discrete Wavelet Multitone Modulation | 1 | T1 | |
| **Total periods required:** | | **11** | | |
| **Grand total periods required:** | | **54** | | |

**Text Books:**


T1: Raghuveer M.Rao and Ajit S.Bopardikar, "*Wavelet Transforms-Introduction to theory and applications*", Pearson edu, 1998.

T2: Soman.K.P, Ramachandran.K.I, Resmi.N.G, "*Insight into Wavelets from theory to Practice"*, PHI, Third Edition, 2010.


**Reference Books:**


R1. R. C. Gonzalez, R. E. Woods, "*Digital Image Processing*," 2nd Edition, Pearson Education, 1992.

R2: Jaideva C Goswami, Andrew K.Chan, "*Fundamentals of Wavelets-Theory, Algorithms and Applications"*, John Wiley and sons, 1999.

R3: C.Sidney Burrus, Ramesh A Gopinath and Haitao Guo, "*Introduction to Wavelets and Wavelet Transforms"*, Prentice Hall, 1998.


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