G. PULLA REDDY ENGINEERING COLLEGE (Autonomous): KURNOOL

Accredited by NBA of AICTE and NAAC of UGC
An ISO 9001:2008 Certified Institution
Affiliated to JNTUA, Anantapuramu.

M.Tech Syllabus- Scheme 2017

(Communications & Signal Processing)

TWO YEAR M.TECH DEGREE COURSE (SCHEME – 2017)

Scheme of instruction and Examination

(Effective from 2017-18)

M.Tech I Semester **COMMUNICATIONS AND SIGNAL PROCESSING**

S. No.	Course No.	Course Title	Credits	Scheme of Instruction periods/week			Scheme of Examination		
				L	T	P	End Exam Marks	Internal Assessment Marks	Total Marks
1.	EC801	Detection & Estimation Theory (DET)	3	3	-	-	60	40	100
2.	EC802	Adaptive Signal Processing (ASP)	3	3	-	-	60	40	100
3.	EC803	Advanced Digital Communications (ADCM)	3	3	-	-	60	40	100
4.	EC804	Mobile Communications (MCN)	3	3	-	-	60	40	100
5.		Elective –I	3	3	-	-	60	40	100
6.		Elective –II	3	3	-	-	60	40	100
7.	AU101	Technical English	-	2	-	-	-	-	-
8.	EC813	Advanced Comm. Lab (ACP)	2	-	-	3	50	50	100
		TOTAL	**20**	**20**	**-**	**3**	**410**	**290**	**700**

M.Tech II Semester **COMMUNICATIONS AND SIGNAL PROCESSING**

S. No.	Course No.	Course Title	Credits	Scheme of Instruction periods/week			Scheme of Examination		
				L	T	P	End Exam Marks	Internal Assessment Marks	Total Marks
1.	EC901	Digital Image processing and Pattern Recognition.(DIPPR)	3	3	-	-	60	40	100
2.	EC902	Optical Communications (OCN)	3	3	-	-	60	40	100
3.	EC903	Statistical Signal Processing (SSP)	3	3	-	-	60	40	100
4.	EC904	Microwave Communications (MWC)	3	3	-	-	60	40	100
5.		Elective-III	3	3	-	-	60	40	100
6.		Elective-IV	3	3	-	-	60	40	100
7	AU102	Research Methodology (RM)	-	2	-	-	-	-	-
8.	EC913	Advanced DSP. Lab (ADSPP)	2	-	-	3	50	50	100
		TOTAL	**20**	**20**	**-**	**3**	**410**	**290**	**700**

S. No.	Course No.	Course Title	Credits	Scheme of Instruction periods/week			Scheme of Examination		
				L	T	P	End Exam Marks	Internal Assessment Marks	Total Marks
1.	EC914	Dissertation	12	-	-	-	50	50	100

List of Subjects for Electives

Description	Subject title	Code
Elective-I	Coding Techniques (CTH)	EC805
	Applied Mathematics for Communication Engineers (AMCE)	EC806
	Microwave Integrated Circuits (MIC)	EC807
	Advanced 3G & 4G Wireless Communications (3G&4G)	EC808
Elective II	Radar Signal Processing (RSP)	EC809
	Speech Processing (SP)	EC810
	Neural Networks & Fuzzy Logic (NNFL)	EC811
	Wavelet Transforms and Applications (WTA)	EC812
Elective III	Internetworking with TCP/IP (TCP/IP)	EC905
	Cognitive Radio (CR)	EC906
	Wireless Communications and Networks (WCN)	EC907
	High Speed Networks (HSN)	EC908
Elective IV	System Modeling & Simulation (SMS)	EC909
	Artificial Intelligence (AI)	EC910
	Advanced Operating System (AOS)	EC911
	Design of Digital Processing Systems (DDPS)	EC912

DETECTION & ESTIMATION THEORY (DET)

I Semester : CSP				Scheme : 2017			
Course Code	Hours/Week			Credits	Maximum Marks		
EC801	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	3	-	-	3	40	60	100
Sessional Exam Duration : 2 Hrs				End Exam Duration: 3 Hrs			

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the basic properties of estimators

CO2: Understand Detection Theory & detection of signals in noise.

CO3: Understand Linear & Nonlinear Estimations.

Introduction

Properties of estimators, Finding good estimators, Estimation of spectrum from finite duration observations.

Detection theory

Binary decisions - Single observation. Maximum likelihood decision criterion; Neymann-Pearson criterion; Probability of error criterion; Bayes risk criterion; Minimax criterion; Robust detection; Receiver operating characteristics. Multiple observations.

Detection of Signals in Noise1

Minimum probability of Error criterion, Neyman-Pearson criterion for Radar detection of constant and variable, amplitude signals.

Detection of Signals in Noise2

Matched Filters, optimum formulation, detection of random signals, simple problems thereon with multisample cases.

Estimation of signals in Noise

Linear mean squared estimation, non-linear estimates, MAP and ML estimates, maximum likelihood estimate of parameters of linear system, simple problems.

Text Books :

1. Alan V.Oppenheim and Ronald W.Schaffer, *Digital Signal Processing*, PHI,3rd edition,2002
2. J.G.Proakis, *DSP Principles, Algorithms and Applications*, PHI,3rd edition,2002
3. Harry L. Van Trees, "Detection, Estimation and Modulation Theory, Part 1", John Wiley & Sons, edition, 2001.

Reference Books :

1. Steven. M. Kay, *Modern Spectral Estimation, Theory and Applications*, New age International Private Ltd, 2011
2. Shanmugam and Breipohl, *Detection of Signals in Noise and Estimation*, John Wiley & Sons, 2004.
3. Mischa Schwartz, L.Shaw, *Signal Processing: Discrete Sprectral Analysis, Detection, and Estimation, Mc Graw Hill.*

Web References:

1) www.sanfoundry.com/best-reference-books-digital-signal-processing-applications

2) www.dspguide.com/pdfbook.htm

3) www.pearsonhighered.com/...Digital-Signal-Processing-4th.../PGM258227.htm

Question Paper Pattern:

Internal Assessment: The question paper shall consist of **Six** questions out of which the student shall answer any **Four** questions

End Exam: The question paper shall consist of **Eight** questions out of which the student shall answer any **Five** questions

ADAPTIVE SIGNAL PROCESSING (ASP)

I Semester :CSP					Scheme : 2017		
Course Code	Hours/Week			Credits	Maximum Marks		
EC802	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	3	-	-	3	40	60	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the fundamentals of Adaptive Filters

CO2: Analyze the concept of Discrete time random process

CO3: Understand linear predictors and Lattice Predictors of Wiener Filter.

CO4: Analyze Linear FIR Adaptive Filters using steepest descent and Least square approaches.

CO5: Analyze the Linear Adaptive filters using kalman Filtering Algorithm.

Introduction to Adaptive Filters

Adaptive filters, Filter structures, Approaches to the development of Adaptive Filter theory, Applications

Discrete time Stochastic Processes

Stochastic Process, Stationary Process, Wide Sense Stationary process, Strict Sense Stationary Process Spectrum Analysis, Eigen Analysis.

Linear Optimum FIR Filtering

Weiner Filters – Linear Predictors, Lattice predictors. Method of steepest descent, Mean squared error, Least mean square Adaptive algorithm, Gradient Adaptive lattice Algorithm.

Method of Least Squares

Standard Recursive Least squares estimation, comparison of RLS and LMS algorithms. Fast recursive algorithm, Adaptive Forward and Backward linear perdition. Fast Transversal Filters.

Kalman Filtering

Introduction, Recursive Mean Square Estimation Random variables, Statement of Kalman filtering problem, Filtering, Initial conditions, Variants of Kalman filtering, Extend Kalman filtering.

Text Books :

1. Bernard Widrow and Samuel D. Stearns**, "Adaptive Signal Processing"**, Pearson Education (Asia) Pte. Ltd., 2001.

2. Simon Haykin, **"Adaptive Filters"**, Pearson Education (Asia) Pte. Ltd, 4th edition, 2002.

3.J.G. Proakis, C.M. Rader, F. Ling, C.L. Nikias, M. Moonen and I.K. Proudler, **"Algorithms for Statistical Signal Processing"**

Reference Books :

1. Monson H. Hayes, **"Statistical Digital Signal Processing and Modelling"**, John Wiley & Sons (Asia) Pte. Ltd., 2002.

2. Dimitris G. Manolakis, Vinay K. Ingle, and Stephen M. Kogon, **"Statistical and Adaptive Signal Processing: Spectral Estimation, Signal Modelling, Adaptive Filtering and Array Processing"**, McGraw- Hill International Edition, 2000.

3.Adaptive Signal Processing - **Bernard Widrow, Samuel D. Strearns**, 2005, PE

Web References:

1.nptel.ac.in/syllabus/syllabus_pdf/117105026.pdf

2.https://books.google.co.in/books?isbn=0470575743

3.https://www.spsc.tugraz.at/courses/adaptive

Question Paper Pattern:

InternalAssessment: The question paper shall consist of **Six** questions out of which the student shall answer any **Four** questions

EndExam: The question paper shall consist of **Eight** questions out of which the student shall answer any **Five** questions

ADVANCED DIGITAL COMMUNICATIONS (ADCM)

I Semester : CSP				Scheme : 2017			
Course Code	Hours/Week			Credits	Maximum Marks		
EC803	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	3	-	-	3	40	60	100
Sessional Exam Duration : 2 Hrs				End Exam Duration: 3 Hrs			

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the concepts of Digital Communication model, MSK, GMSK and Transmultiplexers

CO2: Analyze the operation of Equalizers in designing optimum receivers

CO3: Thoroughly understand the concept and operation of MSAT networks

CO4: Implement the knowledge of Mobile data communications in the design of wireless networks.

CO5: Understand the concepts of GSM, GPRS network architecture.

Overview Of Digital Communication

Digital communication system model, Communication channels characteristics and Models, MSK and GMSK, Transmultiplexers.

Communication through Band-Limited Linear Filter Channels

Optimum receiver structures for AWGN channel. Signal design for band limited and power limited channels, power and bandwidth efficiency tradeoff. ISI and equalization-Linear equalization, Decision feedback equalization, Turbo equalization, Self recovering equalization, Adaptive linear equalization.

Global Mobile Satellite Systems

MSAT networks, Operating environment, concept, CDMA network, Iridium, Global star and Teledesic systems and their comparisons.

Mobile Data Communications

Wireless LANs – IEEE 802.11 and HIPERLAN, Mobile IP, Mobile multimedia, WATM, Bluetooth, Wi-Fi.

GSM & GPRS

Global System for Mobile Communication (GSM) system overview- GSM Architecture, Mobility management, Network signaling. General Packet Radio Services (GPRS)- GPRS Architecture, GPRS Network Nodes.

Text Books :

1. S. Haykin - *Digital communication*, Wiley 1999.
2. Tri T.H.A -*Digital Satellite Communications* by, Mc Graw Hill 2nd edition 2009.
3. Raj Pandya- *Mobile and Personal Communication Systems and Services, IEEE Press, 2004.*
4. William Stallings- *Wireless Communication and Networks*, PHI, 2007
5. T.S. Rappaport-*Wireless Communications Principles and Practice*, 2nd Ed, PHI, 2005.

Reference Books :

1. John G. Proakis - *Digital Communication* ,Mc-Graw Hill, 2000
2. A.J.Viterbi - *Principles of Digital communication*,Mc Graw Hill

Web References:

1.https://www.youtube.com/watch?v=1POzl9tZXuQ&list=PLXjHn7CHrmTdl365uztpUVLx4zwbFgbl

2. http://wireless.ictp.it/school_2002/lectures/ermanno/HTML/802.11_Architecture.pdf

3. nptelvideos.in/2012/12/digital-communication.html

Question Paper Pattern:

Internal Assessment: The question paper shall consist of **Six** questions out of which the student shall answer any **Four** questions

End Exam: The question paper shall consist of **Eight** questions out of which the student shall answer any **Five** questions

MOBILE COMMUNICATIONS (MCN)

I Semester : CSP				Scheme : 2017			
Course Code	Hours/Week			Credits	Maximum Marks		
EC804	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	3	-	-	3	40	60	100
Sessional Exam Duration : 2 Hrs				End Exam Duration: 3 Hrs			

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the significance of the 3G and 4G mobile networks.

CO2: Analyze about the choice of proper mobile components to meet the design requirements of advanced networks.

CO3: Thoroughly learn the concepts of Mobile Radio propagation.

CO4: Apply the concepts of multiple channel bandwidth systems.

CO5: Analyze the concepts of directional antenna array and space diversity schemes.

Introduction

Evolution of mobile radio communications, mobile radio systems around the world, Trends in cellular radio and personal communication, First generation (1G), Second generation (2G), Third generation (3G) and Fourth generation(4G) mobile radio networks, personal area networks.

Mobile Radio Environment

Representation of a mobile radio signal, caused propagation path loss, causes & types of fading, Reciprocity principle, cumulative probability distribution, Correlation and power spectrum, Delay spread and coherence bandwidth, False alarm rate and word-error rate.

Mobile Radio propagation

Free space propagation model, Log-distance path loss model, Log-normal shadowing, Outdoor propagation models, Longley-Rice model, Durkin's model, Okumura model, Hata model, PCS Extension to Hata model, Walfisch and Bertoni model.

Frequency plans and associated schemes

Frequency reuse, FDM, TDM, Spread spectrum and frequency hopping, cellular concept, spectral efficiency and cellular schemes.

Design factors of mobile systems

Antenna locations, antenna spacing, Antenna spacing heights, mobile unit standing still and in motion, sampling rate, directional antennas, frequency dependency, antenna connections and locations on the mobile unit.

Text Books :

1. William C.Y.Lee - *Mobile Communications Design Fundamentals*, 2nd Edition, John wiley,1992.
2. T.S.Rappaport- *Wireless communications*, 2nd Edition, PHI, 2005.

Reference Books :

1. William C.Y.Lee – *Mobile Cellular Telecommunications*, 2nd Edition, Mc GrawHill, 1995.
2. Gordon L.stuber- *Principles of Mobile communication*,Springer,2012.
3. William Stallings - *Wireless Communication and Networks*, PHI, 2007.

Web References:

1. https://www.youtube.com/watch?v=whYljse4Abc
2. nptel.ac.in/courses/117102062/4
3. nptelvideos.in/2012/12/wireless-communication.html

Question Paper Pattern:

Internal Assessment: The question paper shall consist of **Six** questions out of which the student shall answer any **Four** questions

End Exam: The question paper shall consist of **Eight** questions out of which the student shall answer any **Five** questions

TECHNICAL ENGLISH (TE)

I Semester: Common for All M.Tech Programmes						Scheme: 2017		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
AU101	**Audit Course**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
		2	**-**	**-**	**-**	**-**	**-**	**-**
Sessional Exam Duration: -						**End Exam Duration: -**		

Course Outcomes: At the end of the course students will be able to

CO 1: write Technical Reports, Journal Papers and Project Reports.

CO 2: write Job Applications, Resumes and Statements of Purpose.

Course Content

1. Technical Reports –Formats and Styles
   a) Feasibility Report
   b) Factual Report
   c) Project Reports
2. Journal Papers- Formats
3. Paper Presentation Strategies
4. Statement of Purpose for Internships and Apprenticeships
5. Letter Writing- Job Applications, Resume Preparation
6. Common Errors in Research Papers

Reference Books:

1. Sangeeta Sharma & Binod Mishra, Communication Skills for Engineers and Scientists, PHI Learning Private Limited.
2. M. Ashraf Rizvi, Effective Technical Communication, Tata McGraw-Hill Publishing Company Ltd., 2005.
3. Thomas S. Kane , The Oxford Essential Guide to Writing, OUP, 2010
4. Joan van Emden, A Guide to Technical Report Writing http://scisweb.ulster.ac.uk/~projects/guide-to-technical-writing-1.pdf

ADVANCED COMMUNICATIONS LAB (ACP)

I Semester : CSP					Scheme : 2017		
Course Code	Hours/Week			Credits	Maximum Marks		
EC813	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	-	-	3	2	50	50	100

End Exam Duration: 3 Hrs

Course Outcomes : At the end of the course the student will be able to

CO1: Perform BER analysis of QPSK and DPSK communication links, Maximum likelihood sequence estimator, decision feedback and linear equalizers.

CO2: Analyze the performance of convolution encoding and Viterbei decoding.

CO3: Model and estimate frequency selective and flat fading channels.

CO4: Perform BER analysis of diversity techniques and multicarrier modulation system.

CO5: Demonstrate the fundamental concepts of optical communications on Optical Fiber communications trainer kit.

LIST OF EXPERIMENTS

1. SIMULATION OF QPSK COMMUNICATION LINK.
2. BER ANALYSIS OF DPSK TRANSMITTED OVER RAYLEIGH FADING CHANNEL
3. BER PERFORMANCE OF DIFFERENT EQUALIZERS.
4. CONVLOUTION ENCODING AND VITERBEI DECODING.
5. MODELING OF FREQUENCY SELECTIVE CHANNEL.
6. MODELING OF FLAT FADING CHANNEL
7. BER ANALYSIS OF DIVERSITY TECHNIQUES
8. CDMA TXR AND RXR.
9. BER ANALYSIS OF MULICARRIER MODULATION
10. CHANNEL ESTIMATION
11. OPTICAL COMMUNICATIONS-I (ESTABLISHING ANALOG AND DIGITAL COMM.LINK)
12. OPTICAL COMMUNICATIONS-II (FINDING LOSSES IN OFC)

Text Books / Reference Books :

1. T.S.Rapparot, *Wireless communications*, 2nd Edition, PHI, 2005.
2. William C.Y.Lee - *Mobile Communications Design Fundamentals*, 2nd Edition, John wiley,1992
3. Optical Fiber Communications – Gerd Keiser, 3rd Ed., 2000, McGraw Hill.

DIGITAL IMAGE PROCESSING AND PATTERN RECOGNITION (DIPPR)

II Semester : CSP					Scheme : 2017		
Course Code	Hours/Week			Credits	Maximum Marks		
EC901	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	3	-	-	3	40	60	100
Sessional Exam Duration : 2 Hrs				End Exam Duration: 3 Hrs			

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the basic concepts of 2-D image acquisition and quantization.

CO2: Analyze the properties image transforms.

CO3: Apply image enhancement and image restoration algorithms on digital images.

CO4: Understand image compression and image segmentation methods.

CO5: Understand the design concept of pattern recognition system.

Introduction to digital image processing and fundamentals

Digital image processing definition and its applications, fundamentals of digital image processing, components of an image processing system, image sampling and quantization, some basic relationships between pixels, array versus matrix operations, linear versus nonlinear operations, arithmetic operations, set and logic operations.

Image Transforms

Study analysis with examples of Fourier transforms, Walsh transform, Hadamard transform, Discrete cosine transform, Hotelling transform and Hough transform

Image Enhancement and Restoration

Image Enhancement :Basic intensity transformation functions, histogram equalization, histogram specification, fundamentals of spatial filtering, smoothing and sharpening spatial filters, smoothing frequency domain filtering fundamentals, smoothing and sharpening frequency domain filters.

Image Restoration :Degradation/Restoration model, algebraic approach to restoration, inverse filtering Wiener filter, constrained least square restoration.

Image Compression and Segmentation

Image Compression: Fundamentals, some basic compression models- Huffman coding, arithmetic coding, LZW coding, bit plane coding, block transform coding and predictive coding.

Image Segmentation: Detection of discontinuities, edge linking and boundary detection- local processing, regional processing, global processing via Hough transform and graph theoretic technique, region based segmentation.

Pattern recognition system

Basic concepts, fundamental problems in pattern recognition system design, design concept and methodologies, character recognition, speech recognition, finger print recognition, clustering concepts, clustering seeking algorithm, maximin distance algorithm and k-means clustering algorithm.

Text Books :

1. R. C. Gonzalez and Richard E. Woods, Digital Image Processing, 3rd edition, pearson education.
2. A. K. Jain, Fundamentals of digital Image processing, 2nd edition, Prentice Hall of India.

Reference Books :

1. J.T. Tou and R.C. Gonzalez, “Pattern recognition principles”, 2nd edition Wesley Publishing company.
2. Richard O. Duda Peter E. Hart and David G. Stork, “Pattern classification’, 2nd edition Wiley publishing company.
3. S. Jayaraman, S. Esakkirajan and T. Veerakumar ” Digital Image Processing”, Tata McGraw Hill Education Pvt. Ltd
4. S.Sridhar, “Digital Image Processing”, 2nd edition, Oxford University Press.

Web References:
1. https://stanford.edu/class/ee368/
2. http://nptel.ac.in/courses/117105079/
3. https://engineering.purdue.edu/~bouman/ece637
Question Paper Pattern:
Internal Assessment: The question paper shall consist of **Six** questions out of which the student shall answer any **Four** questions **End Exam:** The question paper shall consist of **Eight** questions out of which the student shall answer any **Five** questions

OPTICAL COMMUNICATIONS (OCN)

II Semester : CSP					Scheme : 2017		
Course Code	Hours/Week			Credits	Maximum Marks		
EC902	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	3	-	-	3	40	60	100
Sessional Exam Duration : 2 Hrs				End Exam Duration: 3 Hrs			

Course Outcomes : At the end of the course the student will be able to

CO1: The students will be able to understand the concepts of signal propagation through optical fiber.

CO2: The students will be able to understand the working principles of optical components like couplers, isolators, circulators, interferometers and amplifiers.

CO3: The students will be able to understand the concepts of modulation and demodulation in in an optical communication system.

CO4: The students will be able to understand the concepts of transmission engineering like system model, power penalty, dispersion limitations and compensation techniques.

CO5: The students will be able to understand the elements of optical networks and their architectures.

Signal propagation in Optical Fibers:

Geometrical Optics approach and Wave Theory approach, Loss and Bandwidth, Chromatic Dispersion, Non Linear effects- Stimulated Brillouin and Stimulated Raman Scattering, Propagation in a Non-Linear Medium, Self-Phase Modulation and Cross Phase Modulation, Principle of Solitons.

Optical components:

Operating Principles of Couplers, Isolators, Circulators, Mach-Zehnder Interferometer, EDFA and SOA

Modulation and Demodulation:

Signal formats for Modulation, Subcarrier Modulation and Multiplexing, Optical Modulations – Duobinary, Single Side Band and Multilevel modulation, Ideal and Practical receivers for Demodulation.

Transmission System Engineering:

Transmission system engineering: System model, Power penalty, Transmitter, Receiver, Chromatic Dispersion Limits and Compensation Techniques.

Optical Networks:

SONET/SDH, Multiplexing, SONET/SDH Layers, VCAT and LCAs, SONET Frame Structure, Elements of SONET/SDH infrastructure.

Text Books :

1. Optical Networks: A Practical Perspective - Rajiv Ramaswami and Kumar N.Sivarajan, 2nd Ed., 2004, Elsevier Morgan Kaufmann Publishers (An Imprint of Elsevier).
2. Optical Fiber Communications – Gerd Keiser, 3rd Ed., 2000, McGraw Hill.

Reference Books :

1. Optical Fiber Communications: Principles and Practice – John.M.Senior, 2nd Ed., 2000.
2. P. E. Green, **"Optical Networks",** Prentice Hall, 1994.

Web References:

1. http://nptel.ac.in/courses/117101002/
2. http://nptel.ac.in/courses/117104127/
3. http://nptel.ac.in/courses/106105081/9

Question Paper Pattern:

Internal Assessment: The question paper shall consist of **Six** questions out of which the student shall answer any **Four** questions

End Exam: The question paper shall consist of **Eight** questions out of which the student shall answer any **Five** questions

STATISTICAL SIGNAL PROCESSING (SSP)

II Semester :CSP					Scheme : 2017		
Course Code	Hours/Week			Credits	Maximum Marks		
EC903	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	3	-	-	3	40	60	100
Sessional Exam Duration : 2 Hrs				End Exam Duration: 3 Hrs			

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the concept of Discrete Time random Processes.

CO2: Understand the signal modeling using Pronys method ,Iterative Prefiltering, Finite data records and stochastic models.

CO3: Analyse the properties of Levinson Recursion.

CO4: Analyse Spectrum Estimation Using parametric and Non Parametric methods.

Discrete Time Random Processes

Introduction, random variables, random processes, filtering random processes, spectral factorization, special types of random processes.

Signal Modeling

Introduction, The least squares method, The Pade approximation, Prony's method: Pole zero modeling, Shank's method, All-pole modeling, Linear prediction, Application: FIR Least squares inverse filters, Iterative prefiltering, and Finite data records Stochastic Models.

Levinson- Durbin Recursion

Introduction, The Levinson -Durbin Recursion, The Levinson Recursion, The Split Levinson Recursion

Non- Parametric Spectral Estimation

Introduction: Properties of Estimators, Finding good estimators, Estimation of spectrum from finite duration observations, Periodogram, Averaged periodogram, Windowing of periodogram via FFT, Blackman-Tukey Spectral Estimator, Performance Characteristics of Non-Parametric Power Spectrum Estimators. Minimum Variance Spectral Estimator, Neyman Peoarson Criterion for detection, Bay's estimator.

Parametric Spectral Estimation

Time series models, relationship between auto-correlation and the model parameters, AR Parameters by Yule-walker, Burg and Sequential estimation methods, selection of AR model order, MA and ARMA models for power spectrum estimator, Maximum entropy spectral estimator, Minimum variance spectral estimator.

Text Books :

1."Lessons in Estimation Theory for Signal Processing, Communication and Control," **Jerry M. Mendel,**Prentice Hall Inc., 1995

2. "Optimum Signal Processing," **Sophocles J. Orfanidis,**2ndedn., McGraw Hill, 1988.

3. "Statistical Digital Signal Processing and Modeling," **Monson H. Hayes,** John Wiley & Sons Inc., 1996.

Reference Books :

1. "Decision and Estimation Theory," James L. Melsa and David L. Cohn, McGraw Hill, 1978.

2. "Detection and Estimation," Dimitri Kazakos, P. PapantoniKazakos, Computer Science Press, 1990.

3. "Statistical Signal Processing: Vol. 1: Estimation Theory, Vol. 2: Detection Theory,"Steven M. Kay, Prentice Hall Inc., 1998.

Web References:
1. http://nptel.ac.in/courses/117104127/
2.www.aerosmith-songs.com/solution-manual-statistical-signal-processing-estimation-ka.
3. http://nptel.ac.in/courses/106105081/9
Question Paper Pattern:
InternalAssessment: The question paper shall consist of **Six** questions out of which the student shall answer any **Four** questions **EndExam:** The question paper shall consist of **Eight** questions out of which the student shall answer any **Five** questions

MICROWAVE COMMUNICATIONS (MWC)

II Semester : CSP					Scheme : 2017		
Course Code	Hours/Week			Credits	Maximum Marks		
EC904	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	3	-	-	3	40	60	100
Sessional Exam Duration : 2 Hrs				End Exam Duration: 3 Hrs			

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the Concepts of Microwave Propagation and the Microwave Radio System

CO2: Understand the Satellite frequency ranges and the concepts of Satellite links and its Services

CO3: Understand the Concepts of Earth station design and different tracking techniques

CO4: Understand the concepts of Tropospheric Propagation

Microwave Radio System

Types of propagation, line of sight transmission, Radio Horizon, Microwave links, Repeaters, Diversity, Frequency and space diversity systems, Fading, System gain and path losses, Noise and Absorption in Microwave links.

Satellite Links

Frequency ranges, orbits, up link, transponders, downlinks, satellite system parameters, multiple access, system noise ratio G/T ratio, calculation of system noise temperatures, Noise figures, Design of satellite links for specified (C/N), Radio attenuation model.

Satellite Services

MSAT service, BSAT service, RADARSAT service, SAR SAT service, INTEL SAT service, INMAR SAT service, VSAT service

Earth Station

Earth station design for low system noise temperature, linear apertures, rectangular apertures, circular apertures, tracking techniques, low noise amplifiers, high power amplifiers, terrestrial links and distribution.

Microwave Troposcatter propagation

Introduction to OTH (Over The Horizon) systems, Tropospheric forward-scatter radio link,Block diagram of Troposcatter Communication link, Transmission interference and signal damping, derivation of LOS communication range, derivation for field strength of a Tropospheric wave, Fading in troposphere and its effect on Troposcatter propagation

Text Books :

1. Roddy D, *Microwave Techonology*, Reston Publications
2. Chatterjee R, *Microwave Engineering*, East West Press.
3. Kulkarni M, *Microwave Radar Engineering*, Umesh Publications

Reference Books :

1. Tomasi M, *Advanced Electronic Communication Systems*, Prentice Hall.
2. Combes,Graffewil and Sauterean, *Microwave Components, Devices and Active Circuits* , John wiley
3 Annapurna Das, Sesri . K.Das , *Microwave Engineering*, Tata Mc GrawHill

Web References:

1. https://www.youtube.com/watch?v=whYljse4Abc
2. nptel.ac.in/courses/117102062/4

Question Paper Pattern:

Internal Assessment: The question paper shall consist of **Six** questions out of which the student shall answer any **Four** questions

End Exam: The question paper shall consist of **Eight** questions out of which the student shall answer any **Five** questions

RESEARCH METHODOLOGY (RM)

II Semester : CSP				Scheme : 2017			
Course Code	Hours/Week			Credits	Maximum Marks		
EC1012	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	2	-	-	-	-	-	-
Sessional Exam Duration : 2 Hrs				End Exam Duration: -			

Course Outcomes : At the end of the course the student will be able to

CO1: Understand overview of research process, state the research problem and conduct a literature review of the concepts comprising the research questions.

CO2: Study the data collection methods and process the data statistically.

CO3: Understand the basic properties of estimators, analyse the estimated data and interpret the data in a research paper.

Meaning, Objective and Motivation in Research

Types of Research, Research Approaches, Research Process, Validity and Reliability in Research. Features of Good Design, Types of Research Design, Basic Principles of Experimental Design, Steps in Sampling Design, Characteristics of a Good Sample Design, Random Samples and Random Sampling Design.

Measurement and Scaling Techniques

Errors in Measurement, Tests of Sound Measurement, Scaling and Scale Construction Techniques, Forecasting Techniques, Time Series Analysis, Interpolation and Extrapolation.

Methods of Data Collection

Primary Data, Questionnaire and Interviews, Collection of Secondary Data, Cases and Schedules.

Statistical Processing

Correlation and Regression Analysis, Method of Least Squares, Regression Vs. Correlation, Correlation Vs. Determination, Types of Correlation and Their Specific Applications.

Hypothesis Testing

Tests of Hypothesis, Parametric Vs. Non-Parametric Tests, Procedure for Testing Hypothesis, Use of Statistical Techniques for Testing Hypothesis, Sampling Distribution, Sampling Theory Chi-Square Test, Analysis of Variance and Covariance, Multivariable Analysis

Interpretation of Data

Data interpretation, Layout of a Research Paper, Techniques o f Interpretation.

Text Books / Reference Books :

1. C.R. Kothari, *Research Methodology (Methods & Techniques)*, New Age International Publishers.
2. R.Cauvery, V.K.Sudha Nayak, M.Girija, Research Methodology, S.Chand Publishers.

ADVANCED DSP LAB (ADSPP)

II Semester : CSP					Scheme : 2017		
Course Code	Hours/Week			Credits	Maximum Marks		
EC913	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	-	-	3	2	50	50	100

End Exam Duration: 3 Hrs

Course Outcomes : At the end of the course the student will be able to

CO1: Design digital IIR and FIR filters for DSP applications.

CO2: Analyze the effect of sampling rate conversion and design multirate FIR filters.

CO3: Apply parametric and non-parametric methods for power spectrum estimation.

CO4: Demonstrate their abilities towards TMS320C6748 DSP processor based implementation of digital signal processing concepts.

CO5: Demonstrate real time application on TMS320C6748 DSP processor.

LIST OF EXPERIMENTS

CYCLE – I (MATLAB)

1. A) DESIGN OF BUTTERWORTH IIR FILTERS
   B) DESIGN OF FIR FILTERS UISNG WINDOW METHOD
2. UPSAMPLING AND DOWN SAMPLING.
3. SAMPLING RATE CONVERSION BY FACTOR L/M.
4. MULTIRATE IMPLEMENTATION OF FIR FILTERS.
5. POWER SPECTRUM ESTIMATION USING NON-PARAMETRIC METHODS
6. POWER SPECTRUM ESTIMATION USING PARAMETRIC METHODS CYCLE – II (TMS320C6748)
7. LINEAR CONVOLUTION
8. CIRCULAR CONVOLUTION
9. IMPULSE RESPONSE
10. DIFFERNCE EQUATION
11. N-POINT DFT
12. AUDIO LOOPBACK (INTERRUPT AND POLLING METHODS)
13. AVERAGE FILTER
14. IMPLEMENTATION OF FIR FILTER
15. FACE DETECTION

Text Books / Reference Books :

1. John G.Proakis, DimitrisG.Manolakis, *Digital Signal Processing, Principles,Algorithms and Applications*, Pearson Education India,4th Edition,2007.
2. Monson H.Hayes, *Statistical Digital Signal Processing and Modeling*, John Wiley and Sons, 1991.

CODING TECHNIQUES (CTH)

I Semester : CSP					Scheme : 2017		
Course Code	Hours/Week			Credits	Maximum Marks		
EC805 (Elective-I)	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	3	-	-	3	40	60	100
Sessional Exam Duration : 2 Hrs				End Exam Duration: 3 Hrs			

Course Outcomes : At the end of the course the student will be able to

CO1: Main objective the course is to provide insight about introduction to source coding and channel coding.

CO2: To provide the design of the linear block codes and cyclic codes for encoding and decoding.

CO3: To familiarize the design of BCH, Reed Solomon codes.

CO4: To familiarize the design of Convolution codes for both encoding and decoding.

Source Coding:

Mathematical models for information. A logarithmic measure of information. Average and Mutual information and Entropy, Information measures for continuous random variable. Coding for discrete sources: Coding for discrete memory less sources discrete stationary source, Shannon-Fano coding, Huffman code, Huffman code applied for pair of symbols, efficiency calculations, Lempel-Ziv codes.

Channel Coding:

Linear Block Codes: Systematic linear codes and optimum decoding for the Binary Symmetric chancel, generator and parity check matrices, Syndrome decoding on Symmetric Channels, Hamming Codes.
Cyclic codes: Algebraic structure of cyclic codes, Binary Cyclic code properties, Encoding in systematic and non-systematic form, Encoder using (n-k) bit shift register, Syndrome Computation and Error detection, Decoding of Cyclic Codes.

BCH Codes:

Idempotent and Mattson – Solomon Polynomials, Reed-Solomon Codes, Justin Codes, MDS Codes, Alternate, Goppa and Generalized BCH Codes, Spectral properties.

Decoding of BDH Codes:

Berlekamp's decoding algorithm, Massey's minimum shift register synthesis technique and its relation to Berlekamp's algorithm. A fast Belekamp-Massey algorithm.

Convolutional Codes

Encoding of Convolutional codes, Structural properties of Convolutional codes, state diagram, Tree diagram, Trellis Diagram, Maximum Likelihood decoding of Convolutional codes. Wozencraft's sequential decoding algorithms, Fann's algorithm and other sequential decoding algorithm.

Text Books :

1. R.E. Balabut, *Theory and practice of Error Control Codes*, Addison Wesley, 1983.
2. Bernard sklar,"Digital Communications-Fundamental and Application", Pearson Education, Asia.

Reference Books :

1. F.J. MacWillans and N.J.A. Slone, *The Theory of Error Correcting Codes*, Nort Holland, 2006.
2. K. Sam Shanmugam, "Digital and Analog Communication Systems", Wisley Publications.
3. John D Proakis, *Digital Communications*, 3rd Ed, Mc Graw Hill, 2008.

Web References:

1. https://www.youtube.com/watch?v=whYljse4Abc
2. nptel.ac.in/courses/117102062/4
3. nptelvideos.in/2012/12/codingtechniques.html

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APPLIED MATHEMATICS FOR COMMUNICATION ENGINEERS (AMCE)

I Semester : CSP					Scheme : 2017		
Course Code	Hours/Week			Credits	Maximum Marks		
EC806 (Elective-I)	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	3	-	-	3	40	60	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Students will able to know about all the Bessel function matrix theory, random variables for one and two dimensional and models and Applications.

SPECIAL FUNCTIONS

Bessel's equation – Bessel function – Recurrence relations - Generating function and orthogonal property for Bessel functions of first kind – Fourier-Bessel expansion

MATRIX THEORY

Some important matrix factorizations – The Cholesky decomposition – QR factorization – Least squares method – Singular value decomposition – Toeplitz matrices and some applications.

ONE DIMENSIONAL RANDOM VARIABLES

Random variables - Probability function – moments – moment generating functions and their properties – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions – Function of a Random Variable.

TWO DIMENSIONAL RANDOM VARIABLES

Joint distributions – Marginal and Conditional distributions – Functions of two dimensional random variables – Regression Curve – Correlation

QUEUEING MODELS

Poisson Process – Markovian queues – Single and Multi-server Models – Little's formula - Machine Interference Model – Steady State analysis – Self Service queue

Text Books :

1. Moon, T.K., Sterling, W.C., Mathematical methods and algorithms for signal processing, Pearson Education, 2000.
2. Richard Johnson, Miller & Freund, Probability and Statistics for Engineers, 7th Edition, Prentice – Hall of India, Private Ltd., New Delhi (2007)

Reference Books :

1. Taha, H.A., Operations Research, An introduction, 7th edition, Pearson education editions, Asia, New Delhi, 2002.
2. Donald Gross and Carl M. Harris, Fundamentals of Queueing theory, 2nd edition, John Wiley and Sons, New York (1985)

Web References:

1. https://www.youtube.com/watch?v=whYljse4Abc
2. nptel.ac.in/courses/117102062/4

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MICROWAVE INTEGRATED CIRCUITS (MIC)

I Semester : CSP					Scheme : 2017		
Course Code	Hours/Week			Credits	Maximum Marks		
EC807 (Elective-I)	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	3	-	-	3	40	60	100
Sessional Exam Duration : 2 Hrs				End Exam Duration: 3 Hrs			

Course Outcomes : At the end of the course the student will be able to

CO1: Able to acquire the knowledge about all basic microwave devices

CO2: Able to know about the all microwave tubes and integrated circuits

Introduction to Microwave Integrated Circuits

MMIC- technology, advantages and applications, Active device technologies, design approaches, multichip module technology, substrates.

Passive Components

Inductors, capacitors, resistors, microstrip components, coplanar circuits, multilayer techniques, micromachined passive components, switches & attenuators, filter design

Amplifiers

Stability & gain analysis, matching techniques, reactively matched amplifier design, LNA OSCILLATORS Design principles, active device CAD techniques for large signal oscillators design, phase noise, MMIC_VCO, mixers

Integrated antennas and measurement techniques

Integrates antenna selection, photonic band gap antennas, micro machined antenna, micro electro mechanical system antennas, test fixture measurements, probe station measurements, thermal and cryogenic measurements, experimental field probing techniques.

Text Books :

1. Ravender Goyal, "Monolithic MIC; Technology & Design", Artech House, 1989
2. Gupta K.C. and Amarjit Singh, " Microwave Integrated Circuits", John Wiley, New York, 1975

Reference Books :

1. Hoffman R.K. "Handbook of Microwave Integrated Circuits", Artech House, Boston, 1987.
2. Ulrich L. Rohde and David P.N., " RF / Microwave Circuit Design for Wireless Applications", John Wiley, 2000
3. C. Gentili, " Microwave Amplifiers and Oscillators", North Oxford Academic, 1986.

Web References:

1. https://www.youtube.com/watch?v=whYljse4Abc
2. nptel.ac.in/courses/117102062/4

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ADVANCED 3G & 4G WIRELESS COMMUNICATIONS (3G & 4G)

I Semester : CSP					Scheme : 2017		
Course Code	Hours/Week			Credits	Maximum Marks		
EC808 (Elective-I)	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	3	-	-	3	40	60	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the wireless channel, fading and diversity

CO2: Understand the broad band wireless channel modeling

CO3: Understand the concept of frequency reuse and multiple access technologies

CO4: Analyze the concept of CDMA, OFDM, MIMO & UWB

CO5: Analyze the concept of 3G and 4G Wireless Standards

Wireless Communications and Diversity:

Introduction to 3G/4G Standards, Wireless Channel and Fading, Rayleigh Fading and BER of Wired Communication, BER for Wireless Communication, Introduction to Diversity, Multi-antenna Maximal Ratio Combiner, BER with Diversity, Spatial Diversity and Diversity Order

Broadband Wireless Channel Modelling

Wireless Channel and Delay Spread, Coherence Bandwidth of the Wireless Channel, ISI and Doppler in Wireless Communications, Doppler Spectrum and Jakes Model

Cellular Communication

Introduction to Cellular Communications, Frequency reuse, Multiple Access Technologies, Cellular Processes - Call Setup, Handover etc., Teletraffic Theory.

CDMA & OFDM

Introduction to CDMA, Walsh codes, Variable tree OVSF, PN Sequences, Multipath diversity, RAKE Receiver, CDMA Receiver Synchronization, introduction to OFDM, Multicarrier Modulation and Cyclic Prefix, Channel model and SNR performance, OFDM Issues – PAPR, Frequency and Timing Offset Issues.

MIMO & UWB (Ultra wide Band):

Introduction to MIMO, MIMO Channel Capacity, SVD and Eigenmodes of the, MIMO Channel , MIMO Spatial Multiplexing – V-BLAST, MIMO Diversity – Alamouti, OSTBC, MRT, MIMO - OFDM, UWB Definition and Features, UWB Wireless Channels, UWB Data Modulation, Uniform Pulse Train, Bit-Error Rate Performance of UWB.

3G and 4G Wireless Standards

Architectures of WCDMA, LTE, WiMAX

Text Books :

1. Principles of Modern Wireless Communication Systems-Aditya K. Jagannatham, Publisher-McGraw Hill.

2. Fundamentals of Wireless Communications – David Tse and PramodViswanath, Publisher - Cambridge University Press.

3. Wireless Communications: Andrea Goldsmith, Cambridge University Press.

Reference Books :

1. Wireless Communications: Principles and Practice –Theodore Rappaport - Prentice Hall.

2. MIMO Wireless Communications – EzioBiglieri – Cambridge University Press.

Web References:
1. https://www.youtube.com/watch?v=-ymnQ5rpcYA
2. www.nptelvideos.in/2012/11/advanced-3g-and-4g-wireless-mobile.html
Question Paper Pattern:
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RADAR SIGNAL PROCESSING (RSP)

I Semester : CSP					Scheme : 2017		
Course Code	Hours/Week			Credits	Maximum Marks		
EC809 (Elective-II)	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	3	-	-	3	40	60	100
Sessional Exam Duration : 2 Hrs				End Exam Duration: 3 Hrs			

Course Outcomes : At the end of the course the student will be able to

CO1: Able to know about the all radar systems, design of radar systems and requirements of radar systems

CO2: Able to characterize the performance of radar system

CO3: Able to analyze Phase, Frequency and Linear FM Coding Techniques

Introduction

Radar functions and application, target, detection, resolution and clutter, Basic surveillance Radar – implementation.

Radar Range Performance

Radar Range equation – parameters, loss factors, Radar detection with noise Jamming, volume clutter and area clutter. Detection probability, false alarm sensitivity and introduction to CFAR technique, basics of CACFAR processor, Resolution cell and measurement accuracy, Ambiguities in Range and Doppler.

Signal Processing & Wave form Selection-I

Introduction, matched filter processing Matched filter receiver, matched filter and correlation function, efficiency of practical filters, effect of transmitted waveform, correlation detection – cross correlation receiver. Detection criteria – Neyman – Pearson observer, ideal observer, sequential observer, likelihood ratio, Maximum likelihood function, Inverse probability criterion. Uncertainty relation.

Signal Processing & Wave form selection – II

Transmit waveforms – types, design criteria, Radar Ambiguity function – principles, properties, expels, Radar environmental diagram, optimization, desirability of range- Doppler Ambiguities.

Phase coding techniques

Principles, Random binary coding, binary periodic sequences, ambiguity function for PR sequences, maximal length binary codes, perfect words and codes, poly phase codes. Decoding techniques – analog and digital schemes. Noise and clutter performances.

Linear FM and frequency coding Techniques

Principles, linear FM pulses, generation and decoding, distortion effects on LFM signals, discrete frequencies – waveform analysis, capabilities. Resolution properties of frequency coded pulses.

Text Books :

1. M.I.Skolnik, *Introduction to Radar Systems*, Mc Graw-Hill, 3rd edition.
2. M.I.Skolnik, *Radar Hand Book*, 2nd Ed, McGraw-hill.

Reference Books :

1. F.E.Nathanson, Radar Design Principles, *Signal Processing and Environment*, 1st Ed, Mc Graw Hill.
2. Ramon Nitzberg, *Radar Signal Processing and Adaptive Systems*, Artech. House.

Web References:

1. https://www.youtube.com/watch?v=whYljse4Abc
2. nptel.ac.in/courses/117102062/4

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SPEECH PROCESSING (SP)

I Semester : CSP					Scheme : 2017		
Course Code	Hours/Week			Credits	Maximum Marks		
EC810 (Elective-II)	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	3	-	-	3	40	60	100
Sessional Exam Duration : 2 Hrs				End Exam Duration: 3 Hrs			

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the mechanism of speech productions and speech models and time domain models

CO2: Analyze the modulation schemes of speech waveforms and Short Time Fourier analysis

CO3: Understand the properties of Homomorphic speech processing

CO4: Analyze the Linear Predictive Coding of speech and their applications

Digital Models for the Speech Signal

The process of speech production, Acoustic theory of speech production, Lossless tube models, and digital models for speech signals

Time domain models for speech processing

Time dependent processing of speech, short time energy and average magnitude, zero crossing rate, pitch period estimation, short time auto-correlation function, median smoothing and speech processing

Digital representation of speech waveform

Quantization, instantaneous and adaptive delta modulation, DPCM, comparison of systems.

Short time Fourier Analysis

Basic model for short time analysis and synthesis of speech, implementation of filter bank summation method using FFT, pitch detection, analysis-by- synthesis. Analysis – synthesis systems.

Homomorphic speech processing

complex cepstum approach, pitch detection, Format detection, homomorphic vocoder

Linear Predictive coding of speech

Principles of linear predictive analysis, solution of LPC Equation; Prediction error signal, frequency domain representation of LPC analysis; Relation between the various speech parameters, synthesis of speech from LP parameters and applications.

Speech Coding

Sub–band coding, transform coding, channel Vocoder, Formant Vocoder, ceptral Vocoder, LP Vocoders. Vector quantizer coders. Man-machine communication, speaker recognition system, speech recognition systems.

Text Books :

1. L.R.Rabiner & R.W. Schafer, *Digital processing of Speech Signals*, PHI, 2005
2. Paramichalis, *Practical Approach to Speech Coding*, PHI, 2006.

Reference Books :

1. Owens, *Signal Processing of Speech, 2003.*
2. Dellar & Proakis, *Digital Speech Processin, 2007.*

Web References:

1. https://www.youtube.com/watch?v=whYljse4Abc
2. nptel.ac.in/courses/117102062/4

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NEURAL NETWORKS AND FUZZY LOGIC (NNFL)

I Semester : CSP					Scheme : 2017		
Course Code	Hours/Week			Credits	Maximum Marks		
EC811 (Elective-II)	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	3	-	-	3	40	60	100
Sessional Exam Duration : 2 Hrs				End Exam Duration: 3 Hrs			

Course Outcomes : At the end of the course the student will be able to

CO1: Understand organization of biological neural networks, characteristics of artificial neural networks and their training methods.

CO2: Understand basics of learning and training algorithms and applications of various Neural Networks such as Perceptron, Counter Propagation Networks, Recurrent Networks, BAM and ART

CO3: Understand fundamentals of Fuzzy Systems, relations, measures and various Fuzzy System architectures

Biological Neural Network

Organisation of human brain, Neuron functions-cell body, Dendrites, Axon, Cell membrane, computers and human brains

Artificial Neural Networks

Characteristics, single layer and multi-layer Artificial Neural Networks, Training: objective, supervised and unsupervised training, overview

Perceptrons

perceptron representation, learning, training algorithm, advanced algorithms and applications.

Neural Dynamics

Counters propagation Networks: Introduction, Network structure, Normal operation, training the Kohonen and Grossberg layers, full counter propagation network, applications

Statistical Methods

Training, applications, applications to non-linear optimisation problems, Back propagation and Cauchy training

Hopfield Networks

Recurrent network configurations, applications

Bi-directional Associative Memories

BAM structure, retrieving a stored association, encoding the associations, Memory capability, continuous, adaptive and competitive BAM

Adaptive Resonance Theory

ART architecture and implementation training example, characteristics.

Introduction to Fuzzy Systems

Crisp sets, notation, basic concepts, classical logic, Fuzzy logic, Fuzzy operations -Complement, Union and Intersection

Fuzzy Relations

Binary relations, Equivalence and Similarity relations, compatibility relation, Orderings, morphisms

Fuzzy Measures

Belief and plausibility measures, probability measures, possibility and necessity measures

Fuzzy Associative Memories

Fuzzy and Neural function estimators, Neural vs Fuzzy representation of structured knowledge, FAMs as mappings, Fuzzy hebb FAMs: The Bi-directional FAM, theorem, superimposing FAM rules, FAM system Architecture

Text Books :
1. Bart Kosko, *Neural Networks and Fuzzy Systems*, PHI.
Reference Books :
1. Phillip D. Wasserman – Van Nostrand Reinhold, *Neural Computing, Theory and Practice, 2002*
2. George I Klir and Tina A. Folger, *Fuzzy sets, uncertainty and Information*, PHI, 2001.
Web References:
1. https://www.youtube.com/watch?v=whYljse4Abc
2. nptel.ac.in/courses/117102062/4
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WAVELET TRANSFORMS AND APPLICATIONS (WTA)

I Semester : CSP				Scheme : 2017			
Course Code	Hours/Week			Credits	Maximum Marks		
EC812 (Elective-II)	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	3	-	-	3	40	60	100
Sessional Exam Duration : 2 Hrs				End Exam Duration: 3 Hrs			

Course Outcomes : At the end of the course the student will be able to

CO1: Students are able to understand the wavelet transforms & wavelet filters in image processing applications

CO2: Students are able to apply STFT, CWT & DWT for analyzing signals in Spatial domain

CO3: Students are able to apply the wavelet transforms for analyzing speech & Music signals, SONAR Spectral analysis, image compression, fractal signal analysis and denoising of signals.

Introduction

Vector spaces- properties-dot product- basis-dimension, orthogonality and orthonormality- relationship between vectors and signals- signal spaces-concept of convergence- Hilbert spaces for energy signals- Generalized Fourier Expansion

Fourier Analysis

Fourier transform- Drawbacks of Fourier analysis- Short –time Fourier Transform (STFT) analysis- Spectrogram plot –phase- space plot in time-frequency plane, Time and frequency limitations, Uncertainty principle , Tiling of the Time-Frequency plane for STFT.

Continuous Wavelet Transform

Wavelet Transform-definition and properties – concept of scale and its relation with frequency – Continuous Wavelet Transform (CWT)- Scaling function and wavelet functions (Debauchis, Haar, Coilfet, Mexican, Hat, Sinc, Gaussian , Bi-orthogonal)- Tiling of time- scale plane for CWT.

Discrete Wavelet Transform

Discrete wavelet transform (DWT)- Filter Bank and sub band coding principles- Multi-resolution analysis – time scale difference equations for wavelets ad scaling functions- Wavelet Filters – scale variation in the Discrete domain – Mallat's algorithm for DWT – Inverse DWT computation by filter banks- Multi- band Wavelet transforms.

Applications

Case study-I : Sub-band coding of speech and music. Case study-II : Multi-band wavelet transform based SONAR spectral classification and Transient detection, Case study –III : Image compression using 2- D DWT, Case study-IV : Fractal signal analysis, Case study-V: Denoising of signals

Text Books :

1. Strang G, Nguyen T, *Wavelets and Filter Banks*, Wellesley Cambridge Press, 2007.
2. Vetterli M, Kovacevic J, *Wavelets and Sub-band Coding*, Prentice Hall, 2006.
3. Mallat S, *Wavelet Signal Processing*, Academic Press, 2005.

Reference Books :

1. Meyer Y.et. al, *Wavelet Toolbox Manual (MATLAB)*. Mathworks inc, 2005
2. Wornell GW, *Signal Processing with Fractals: A Wavelet Based Approach*, Prentice hall, 2006
3. Rao. R.M and A.S Bopardikar, *Wavelet Transform*, Addison Wesley, 2006

Web References:

1. https://www.youtube.com/watch?v=whYljse4Abc
2. nptel.ac.in/courses/117102062/4

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INTERNETWORKING WITH TCP/IP (TCPIP)

II Semester : CSP				Scheme : 2017			
Course Code	Hours/Week			Credits	Maximum Marks		
EC905 (Elective-III)	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	3	-	-	3	40	60	100
Sessional Exam Duration : 2 Hrs				End Exam Duration: 3 Hrs			

Course Outcomes : At the end of the course the student will be able to

CO1: Students acquire knowledge about latest Protocols in the field of Network Domain.

CO2: Students acquire knowledge about encryption and decryption algorithms used in communication and Networking Domain.

Introduction and overview

Review of underlying network technologies, Internetworking concept and architectural model

Internet addresses

Mapping Internet addresses to physical address (ARP), determining and Internet address at startup (RARP)

Internet Protocol

Connectionless datagram service, Routing IP datagram, error and control messages (ICMP), Internet multicasting (IGMP) Subnet and supernet address extensions

User Datagram

Protocol, Reliable stream transport service (TCP), TCP State machine, core routers, peers, GGP, SPF protocols, Routing on an autonomous systems (EGP)

TCP/IP over ATM

Networks, Client server model of interaction, the socket interface, DHCP, Domain name system (DNS)

Applications

Remote Login, FTP, TFTP, NFS, Electronic mail (SMTP, MIME), Internet management SNMP, SNMPV2, Internet Security and Firewall design, features of IPV6.

Text Books :

1. Douglas E.Comer, *Internetworking with TCP/IP, Vol-I*, 3rd Ed, PHI.

Reference Books :

1. TCP/IP Illustrated, Volume 1: The Protocols, W. Richard Stevens, W. Richard Stevens, Pearson Education Asia, 2002.
2) High Performance TCP/IP Networking-Mahbub Hassan, Raj Jain, PHI, 2005

Web References:

1. https://www.youtube.com/watch?v=whYljse4Abc
2. nptel.ac.in/courses/117102062/4

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COGNITIVE RADIO (CR)

II Semester : CSP					Scheme : 2017		
Course Code	Hours/Week			Credits	Maximum Marks		
EC906 (Elective-III)	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	3	-	-	3	40	60	100
Sessional Exam Duration : 2 Hrs				End Exam Duration: 3 Hrs			

Course Outcomes : At the end of the course the student will be able to

CO1: gain knowledge on multi rate systems.

CO2: develop the ability to analyze, design, and implement any application using FPGA.

CO3: be aware of how signal processing concepts can be used for efficient FPGA based system design

CO4: understand the rapid advances in Cognitive radio technologies.

CO5: explore DDFS, CORDIC and its application.

SOFTWARE DEFINED RADIO

Basic SDR – Software and Hardware Architecture of an SDR – Spectrum Management – Managing unlicensed spectrum – Noise Aggregation

SDR AS PLATFORM FOR COGNITIVE RADIO

Introduction – Hardware and Software architecture – SDR development process and Design – Application software – Component development – Waveform development – cognitive waveform development

COGNITIVE RADIO TECHNOLOGY

Introduction – Radio flexibility and capability – Aware – Adaptive – Comparison of Radio capabilities and Properties – Available Technologies – IEEE 802 Cognitive Radio related activities – Application.

CR- TECHNICAL CHALLENGES

Design Challenges associated with CR – Hardware requirements – Hidden primary user problem – detecting spread spectrum primary users – sensing duration and frequency – security

SPECTRUM SENSING

Overview – Classification - Matched filter – waveform based sensing – cyclo stationary based sensing – Energy detector based sensing – Radio Identifier – Cooperative sensing- other sensing methods

OFDM BASED COGNITIVE RADIO

A Basic OFDM System Model, OFDM based cognitive radio, Cognitive OFDM Systems, MIMO channel estimation, Multi-band OFDM, MIMO-OFDM synchronization and frequency offset estimation. Spectrum sensing to detect Specific Primary System, Spectrum Sensing for Cognitive OFDMA Systems.

Text Books :

1. J. H. Reed, “Software Radio”, Pearson, 2002
2. U. Meyer – Baese, “Digital Signal Processing with FPGAs”, Springer, 2004.
3. H. Arslan “Cognitive Radio, Software Defined Radio and Adaptive Wireless Systems”, University of South Florida, USA, Springer, 2007.

Reference Books :

1. S. K. Mitra, “Digital Signal processing”, McGrawHill, 1998
2. K.C.Chen, R.Prasad , “Cognitive Radio Networks” , Wiley, 2009-06-15.
3. T. W. Rondeau, C.W.Bostian, “Artificial Intelligence in Wireless Communications”,2009.
4. Tusi, “Digital Techniques for Wideband receivers”, Artech House, 2001.
5. T. Darc Chiueh, P.Yun Tsai,” OFDM baseband receiver design for wireless communications”, Wiley,2007
6. Recent literature in Cognitive Radio

Web References:
1. http://www.radio-electronics.com/info/rf-technology-design/cognitive-radio-cr/technology-tutorial.php
2. https://www.youtube.com/watch?v=hzxgDyXbpt4
3. https://www.youtube.com/watch?v=hzxgDyXbpt4
Question Paper Pattern:
Internal Assessment: The question paper shall consist of **Six** questions out of which the student shall answer any **Four** questions **End Exam:** The question paper shall consist of **Eight** questions out of which the student shall answer any **Five** questions

WIRELESS COMMUNICATIONS & NETWORKS (WCN)

II Semester : CSP					Scheme : 2017		
Course Code	Hours/Week			Credits	Maximum Marks		
EC907 (Elective-III)	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	3	-	-	3	40	60	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand Wireless Channel Specifications, Fading & Diversity Schemes.

CO2: Understand the Spread Spectrum Communication Systems, MIMO Systems & Channel Capacities.

CO3: Understand standards in cellular Mobile Communication & Wireless Adhoc Networks

Fading & Diversity

Evolution, Examples of Wireless Communication systems, Evolution, Examples of Wireless Communication systems. Small-Scale Fading and Multipath, Impulse Response Model of a Multipath Channel, Small-Scale Multipath Measurements, Parameters of Mobile Multipath Channels, Types of Small-Scale Fading, Rayleigh and Rican Distributions, Statistical Models for Multipath Fading Channels, Repetition coding and Time Diversity- Frequency and Space Diversity, Receive Diversity- Concept of diversity branches and signal paths- Combining methods- Selective diversity combining - Switched combining- maximal ratio combining- Equal gain combining- performance analysis for Rayleigh fading channels

Cellular Communication and CDMA

introduction to Cellular Networks, Multiple Access: FDM/TDM/FDMA/TDMA. Direct sequence spread spectrum- Frequency Hopping systems, Time Hopping Rake Receiver- Performance analysis. Spread Spectrum Multiple Access, CDMA Systems- Interference Analysis for Broadcast and Multiple Access Channels, Capacity of cellular CDMA networks.

Fading Channel Capacity

Capacity of Wireless Channels- Capacity of flat and frequency selective fading channels, Multiple Input Multiple output (MIMO) systems- capacity of MIMO Channels.

Cellular Wireless Communication Standards

Brief discussion specification of GSM, CDMA, W-CDMA, 3G, 4G, LTE, Wi-max, Wi-Fi. Introduction to Multicarrier Communication (OFDM, MC-CDMA).

Wireless Adhoc Networks

Introduction, Issues in Ad hoc wireless networks, Ad hoc wireless internet. MAC Protocols, Routing Protocols, Transport Layer Protocols & Security of Wireless Adhoc Networks

Report Writing

Interpretation of Data and Report Writing, Layout of a Research Paper, Techniques o f Interpretation.

Text Books :

1. "Wireless Communications" by Andrea Goldsmith, Cambridge University press.
2. "Modern Wireless Communications" by Simon Haykin and Michael Moher, Person Education.
3. "Wireless Communication, principles & practice" by T.S. Rappaport, PHI, 2001.
4. "Principles of Mobile Communications" by G.L Stuber 2nd edition, Kluwer Academic Publishers
5. "Wireless digital communication" by Kamilo Feher PHI, 1995.

Reference Books :

1. "Introduction to Spread Spectrum Communication" by R.L Peterson, R.E. Ziemer and David E. Borth, Pearson Education.
2. "CDMA- Principles of Spread Spectrum" by A.J.Viterbi, Addison Wesley, 1995.
3. "Ad Hoc Wireless Networks: Architectures and Protocols" by C. Siva Ram Murthy, and B. S. Manoj, Prentice Hall Professional Technical Reference, 2008.
4. "Ad Hoc & Sensor Networks: Theory and Applications" by Carlos De Morais Cordeiro, Dharma Prakash Agrawal, World Scientific Publishing Company, 2006.

Web References:

1. nptelvideos.in/2012/12/wireless-communication.html
2. http://wireless.ictp.it/school_2002/lectures/ermanno/HTML/802.11_Architecture.pdf
3. nptelvideos.in/2012/12/digital-communication.html

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End Exam: The question paper shall consist of **Eight** questions out of which the student shall answer any **Five** questions

HIGH SPEED NETWORKS (HSN)

II Semester : CSP					Scheme : 2017		
Course Code	Hours/Week			Credits	Maximum Marks		
EC908 (Elective-III)	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	3	-	-	3	40	60	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the layered architectures, working principles & services provided by various networks like BISDN, ATM and TCP/IP.

CO2: Analyze the performance of High speed networks based on QOS parameters

CO3: Understand the concepts of Signaling, Routing and Switching the information between interconnected networks.

Network Services & Layered Architecture

Traffic characterization and quality of service, Network services, High performance networks, Network elements, Basic network mechanisms, layered architecture.

ISDN & B-ISDN

Over view of ISDN, ISDN channels, User access, ISDN protocols, Brief history of B-ISDN and ATM, ATM based services and applications, principles and building block of B-ISDN, general architecture of B-ISDN, frame relay

ATM Networks

Network layering, switching of virtual channels and virtual paths, applications of virtual channels and connections.

QOS parameters

QOS parameters, traffic descriptors, ATM service categories, ATM cell header, ATM layer, ATM adaptation layer.

Interconnection Networks

Introduction, Banyan Networks, Routing algorithm & blocking phenomenon, Batcher-Banyan networks, crossbar switch, three stage class networks.

Rearrangeable Networks

Rearrangeable class networks, folding algorithm, bens network, looping algorithm.

ATM Signaling, Routing And Traffic Control

ATM addressing, UNI signaling, PNNI signaling, PNNI routing, ABR Traffic management.

TCP/IP Networks

History of TCP/IP, TCP application and Services, Motivation, TCP, UDP, IP services and Header formats, Internetworking, TCP congestion control, Queue management: Passive & active, QOS in IP networks: differentiated and integrated services

Text Books :

1. William Stallings, *ISDN & B-ISDN with Frame Relay*, PHI, 2005
2. Leon Garcia widjaja, *Communication Networks*, TMH, 2006.
3. N. N. Biswas, *ATM Fundamentals*, Adventure Books Publishers, 2005

Reference Books :

1) High Performance TCP/IP Networking-Mahbub Hassan, Raj Jain, PHI, 2005.
2) ATM Networks-Rainer Handel. Manfred n. Hubber, Stefan Schroder, Pearson Edu, 2002
3) High Speed Networks and Internets – William Stallings, Pearson Edu, 2002.
4) High Performance Communication Networks - T. Walrand & P. Varaiya, 2nd Ed., Harcourt Asia Publ.

Web References:
1. nptelvideos.in/2012/12/highspeednetworks.html
2. http://wireless.ictp.it/school_2002/lectures/ermanno/HTML/802.11_Architecture.pdf
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SYSTEM MODELLING & SIMULATION (SMS)

II Semester : CSP				Scheme : 2017			
Course Code	Hours/Week			Credits	Maximum Marks		
EC909 (Elective-IV)	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	3	-	-	3	40	60	100
Sessional Exam Duration : 2 Hrs				End Exam Duration: 3 Hrs			

Course Outcomes : At the end of the course the student will be able to

CO1: Students will be able to work with different packages and simulation

CO2: Students will be able to work with Poisson process in real time

CO3: Students will be able to model and simulate models.

Basic Simulation Modeling, Systems

Models and Simulation, Discrete Event Simulation, Simulation of single server queing system, Simulation of Inventory System, Alternative approach to modeling and simulation.

Simulation Software

Comparison of simulation packages with Programming languages, Classification of Software, Desirable Software features, General purpose simulation packages – Arena, Extend and others, Object Oriented Simulation, Examples of application oriented simulation packages

Building Simulation Models

Guidelines for determining levels of model detail, Techniques for increasing model validity and credibility

Modeling Time Driven Systems

Modeling input signals, delays, System integration, Linear Systems, Motion control models, Numerical Experimentation

Exogenous Signals And Events

Disturbance signals, State Machines, Petri Nets & Analysis, System encapsulation.

Markov Process

Probabilistic systems, Discrete Time Markov processes, Random walks, Poisson processes, the exponential distribution, simulating a poison process, Continuous-Time Markov processes.

Event Driven Models

Simulation diagrams, Queing theory, simulating queing systems, Types of Queues, Multiple servers.

System Optimization

System Identification, Searches, Alpha/beta trackers, Multidimensional Optimization, Modeling and Simulation methodogy.

Text Books :

1. Frank L. Severance, John Wiley & Sons, *System Modeling & Simulation, An Introduction*
2. Averill M. Law, W. David Kelton, *Simulation Modelling and Analysis*, 3rd Ed, TMH.

Reference Books :

1. Geoffery Gordon, *Systems Simulation*, PHI, 2005.

Web References:

1. nptelvideos.in/2012/12/systemmodelingandsimulation.html
2. http://wireless.ictp.it/school_2002/lectures/ermanno/HTML/802.11_Architecture.pdf

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ARTIFICIAL INTELLIGENCE (AI)

II Semester : CSP				Scheme : 2017			
Course Code	Hours/Week			Credits	Maximum Marks		
EC910 (Elective-IV)	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	3	-	-	3	40	60	100
Sessional Exam Duration : 2 Hrs				End Exam Duration: 3 Hrs			

Course Outcomes : At the end of the course the student will be able to

CO1: The student will be able to understand various artificial network and models and the applications of these models to solve engineering problems.

PROLOG

An overview of prolog- an example program: defining family relations, Extending the example program by rules, A recursive rule definition, declarative and procedural meaning of programs. Syntax and Meaning of prolog programs - Data objects, matching. Lists, operators, Arithmetic - Representation of lists, some operations on lists, operator notation, and arithmetic. Using Structures: Example Programs - Retrieving information from a database. Doing data abstraction.

Artificial Intelligence

The AI problems, the underlying Assumption, What is an AI Technique? The level of the model, Criteria for success, Problems, problem spaces, and search - defining the problem as a state space search, production systems, problem characteristics, production system characteristics, issues in the design of search programs.

Heuristic Search Techniques

Generate and test- travelling sales man problem, Hill climbing, Best first search, problem reduction, constraint satisfaction, Mean ends analysis

Knowledge Representation

Representations and mappings, approaches to knowledge representation, The Frame Problem. Using Predicate logic - Representing simple facts in logic, Representing Instance and Isa relationships, Resolution.

Representing Knowledge Using Rules

Procedural versus declarative knowledge, logic programming, forward versus backward reasoning, matching. WEAK SLOT AND FILLER STRUCTURES - Semantic nets, Frames.
STRONG SLOT AND FILLER STRUCTURES - Conceptual dependency, scripts, CYC
GAME PLAYING - MIN MAX search procedure, Adding Alpha Beta cutoffs.

Learning

What is learning, rote learning , learning from taking advice, learning in problem solving, learning from examples: induction, explanation based learning, Hopfield networks, learning in neural networks,

Case Studies

MYCIN, PROSPECTOR, XCON

Text Books / Reference Books :

1. Elaine Richie And Kevin Knight, *Artificial Intelligence, 2005*
2. Ivan Bratko, *Prolog*

Web References:

1. nptelvideos.in/2012/12/artificalintelligence.html
2. http://wireless.ictp.it/school_2002/lectures/ermanno/HTML/802.11_Architecture.pdf

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ADVANCED OPERATING SYSTEMS (AOS)

II Semester : CSP					Scheme : 2017		
Course Code	Hours/Week			Credits	Maximum Marks		
EC911 (Elective-IV)	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	3	-	-	3	40	60	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Students will acquire the knowledge of OS principles-design, memory management and distributed systems

CO2: Students are able to apply the knowledge of UNIX and LINUX operating systems in system design applications and Inter-process Communications

CO3: Students are able to apply TCP/IP protocol stack to design network management protocols and socket programming.

Introduction

Introduction to Operating Systems, Type of operating systems. Overview of UNIX system, Structure, file systems, type of file, ordinary & Special files, file permissions, Introduction to shell.

UNIX

Basic commands & command arguments, Standard input/output Input/output redirection, filters and editors.

Unix Systems Calls

System calls related file structures, input / output process creation & termination.

Interprocess Communication in Unix

Introduction, file and record locking, Client – Server example, pipes, FIFOs, Streams & Messages, Name Speces, Systems V IPC,Message queues,Semaphores, Shared Memory, Sockets & TLI

Introduction to Networks and Network Programming in Unix

Network Primer, TCP/IP – Internet Protocols, Socket Programming – Introduction & overview, UNIX domain protocols, Socket Addresses, Elementary Socket system calls, Simple examples.

Linux

Introduction to LINUX System, editors and utilities, type of shells.

Linux Operations

Shell operations, file structure, file management, Operations.

Text Books :

1. Maurice J.Bach, *The Design of the UNIX Operating Systems*, PHI, 2006.
2. Kernighan & Pike, *The UNIX Programming Environment*, PHI, 2006.
3. W.Richard Stevens, *UNIX Network Programming*, PHI, 2002

Reference Books :

1. Richard Peterson, *The Complete Reference LINUX*, TMH.
2. Ritchie & Yates, *UNIX User Guide*.

Web References:

1. nptelvideos.in/2012/12/advancedoperatingsystems.html
2. http://wireless.ictp.it/school_2002/lectures/ermanno/HTML/802.11_Architecture.pdf

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DESIGN OF DIGITAL SIGNAL PROCESSING SYSTEMS (DDPS)

II Semester : CSP					Scheme : 2017		
Course Code	Hours/Week			Credits	Maximum Marks		
EC912 (Elective-IV)	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	3	-	-	3	40	60	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Acquire knowledge of DSP computational building blocks and knows how to achieve Speed in DSP architecture or processor

CO2: Acquire knowledge about various addressing modes and Instruction set of DSP TMS320C67XX and are able to program DSP processor

CO3: Understanding AIC23 CODEC and programs using matlab and C

CO4: Design of Filters and dsp algorithms programs by using c code and ASM

CO5: understanding the applications of DSP in CODEC

Introduction to a Popular DSP from Texas Instruments

CPU Architecture, CPU Data Paths and Control, Timers, Interrupts, Internal Data/Program Memory, External Memory Interface, Pipelining

Architecture and Instruction Set of the C6x Processor

Introduction , TMS320C6x Architecture, Functional Units, Fetch and Execute Packets , Pipelining, Registers, Linear and Circular Addressing Modes, TMS320C67XX Instruction Set, Assembler Directives , Linear Assembly , ASM Statement Within C , C-Callable Assembly Function , Timers ,Interrupts, Multichannel Buffered Serial Ports , Direct Memory Access , Memory Considerations, Fixed- and Floating-Point Format, Code Improvement, Constraints, Programming Examples Using C, Assembly

DSP Development System

DSK Support Tools, Code Composer Studio, Support Files, TLV320AIC23 (AIC23) On-board Stereo Codec for Input, and Output, Programming Examples Using C Code and assembly

Digital Signal Processing Applications

FIR & IIR digital filter design programs using Matlab, Fourier transform: DFT.FFT Radix 2 programs using matlab, Implementation of real time digital filters using DSP, Implementation of FFT applications using DSP, DTMF Tone generation and Detection

DSP Application Examples in CODEC

Voice Scrambler Using DMA and User Switches,Phase-Locked Loop,Image Processing,Voice Detection and Reverse Playback

Text Books :

1. Digital Signal Processing –A student Guide,1st Edition ;T.J. Terrel and LikKwanShark;Macmillan Press Ltd.
2. Digital Signal Processing :A system Design Approach .1st Edition ;David J DefattaJ,Lucas Joseph G &Hodkiss William S ;John Wiley

Reference Books :

1. Digital signal processing and application with C6713 and C6416 DSK, RulphChassaing ,Worcester Polytechnic Institute, A wiley- Interscience Publication
2. Digital signal processing Implementation using the TMS320C6000 DSP platform, 1st edition ; Naim Dahnoun.

Web References:
1. www.sciencedirect.com/science/book/9780123744906
2. www.wiley.com › ... › Communication Technology › Signal Processing
3. www.ece.umd.edu/.../computer-aided-design-digital-signal-processing-systems
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