ADHIYAMAAN COLLEGE OF ENGINEERING

[An Autonomous Institution Affiliated to Anna University, Chennai]
[Accredited by NAAC]
Dr. M.G.R NAGAR, HOSUR, KRISHNAGIRI (DT) – 635 130, TAMILNADU, INDIA
REGULATIONS 2018
CHOICE BASED CREDIT SYSTEM

M.E- COMMUNICATION SYSTEMS

VISION

To develop well-disciplined and competent engineers who will excel in the field of Electronics and Communication Engineering.

MISSION

- To develop qualified technical personnel with a strong knowledge on basic engineering principles.
- To disseminate Innovative technical skills by fostering excellence in engineering education.
- To promote exemplary professional conduct, to be utilised for the betterment of the society.

The Programme defines Programme Educational Objectives, Programme Outcomes and Programme Specific Outcomes as follows:

I. PROGRAMME EDUCATIONAL OBJECTIVES [PEOs]

PEO 1 Implementing and applying analytical method to solve problems related to research by using advanced technologies in the field of engineering.

PEO 2 To instil professional and ethical attitude in students. To pursue lifelong learning as a means of enhancing knowledge and skills necessary to contribute and accelerate the pace of profession

PEO 3 To inculcate intellectual team work skills for evaluating engineering related concerns from comprehensive social perspective for truly contributing to the needs of the society.

II. PROGRAM OUTCOMES [POs]

PO 1 An ability to relate the proficiency of science and engineering fundamentals to solve complicated engineering issues.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

PO 2 Develop a competence to identify, analyze and review engineering problems by providing an effective out-of-box ideas.

PO 3 To develop a potential bookmarking design solutions for the problem that satisfy the public health, safety and environmental considerations.

PO 4 Amalgamate advanced engineering tools with research specific Hardware and software. Deriving data for unpredictable problems and provide valid conclusions

PO 5 Paraphrasing responsibilities on usage of modern tools to become professionals with an understanding of its limitations

PO 6 Practicing collaborative-multidisciplinary scientific research by adhering to the day-to-day needs of the industrial requirements and technological advances in order to achieve common goals.

PO 7 To be disciplined in practical scenarios and follow ethical values required for the project management and finance in all disciplines.

PO 8 To enhance the communication skills and to learn how to effectively communicate by upgrading the trends and development in technology.

PO 9 An ability to engage in life-long learning by improving knowledge and competence.

PO 10 Adapting to procure intellectual skills, professional code of conduct, ethics of research in the field of advanced engineering with social responsibility.

PO 11 Self-analyzing the outcomes of one's actions and learn through independent and reflective learning.

III. PROGRAM SPECIFIC OUTCOMES [PSOs]

PSO1: Students are competent to identify and solve new research methodologies and cope up with industry-oriented ultimatum.

PSO2: Students become professional and well-disciplined after adapting to the latest modern principles and emerge themselves towards a scintillating pioneering growth.

PSO3: A well competent and competitive spirit of encouragement towards the betterment of the society is achieved and their talents are recognized.

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES(PSOs)

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)	PROGRAM OUTCOMES (POs)											PSOs		
	A	B	C	D	E	F	G	H	I	J	K	1	2	3
PEO 1	3	2	3	1	1		1	1			3	3	2	
PEO 2	1	2		3	1	1		1	1	1	1	3		1
PEO 3					2	1	2	3		1	1			3

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Sem	Course Code	Course Name	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
I	118COT01	Applied Mathematics	3	3		2	3				1		1	3	1	
I	118COT02	Advanced Digital Signal Processing	3	2	3	1	3				1		1	3	1	
I	118COT03	Modern Digital Communication Techniques	3	2	3	1	3				1		1	3	1	
I	118COT04	Optical and Mobile Communication Networks	3	2	3	1	3				1		1	3	1	
I	118COT05	Advanced Radiation Systems	3	2	1						1		1	3	1	
I	118COP01	Communication Systems Laboratory-I	3	2	3	1	3				1		1	3	1	
I	118COE01	Reconfigurable Computing	3	2	3	1	3				1		1	3	1	
I	118COE02	Network Management	3	2	3	1	3				1		1	3	1	
I	118COE03	Research Methodology	3	2	3	1	3				1	2	1	3	1	
I	118COE04	Wavelet Signal Processing	3	2	3	1	3				1		1	3	1	
I	118COE05	WDM Optical Networks	3	2	3	1	3				1		1	3	1	
I	118COE06	Advanced Satellite Based Systems	3	2	3	1	3				1		1	3	1	
II	218COT01	Software Radio Architecture	3	2	1						1		1	3	1	
II	218COT02	Photonic and Microwave Integrated Circuits	3	2	1						1		1	3	1	
II	218COT03	Multimedia Compression Techniques	3	2	1						1		1	3	1	
II	218COP01	Communication Systems Laboratory - II	3	2	1						1		1	3	1	
II	218COE01	RF System Design	3	2	1						1		1	3	1	
II	218COE02	Advanced Microwave Systems	3	2	1						1		1	3	1	
II	218COE03	Communication Protocol Engineering	3	2	1						1		1	3	1	
II	218COE04	Global Positioning Systems	3	2	1						1		1	3	1	

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

Sem	Course Code	Course Name	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
II	218COE05	Analysis and Design of Planar Transmission Lines	3	2	3	1	3				1		1	3	1	
II	218COE06	Mixed - Signal Circuit Design	3	2	3	1	3				1		1	3	1	
II	218COE07	Network Routing Algorithms	3	2	3	1	3				1		1	3	1	
II	218COE08	Digital Communication Receivers	3	2	3	1	3				1		1	3	1	
II	218COE09	Advanced Microprocessors and Microcontrollers	3	2	3	1	3				1		1	3	1	
II	218COE10	Advanced Digital Image Processing	3	2	3	1	3				1		1	3	1	
II	218COE11	Spectral Analysis of Signals	3	2	3	1	3				1		1	3	1	
II	218COE12	Detection and Estimation theory	3	2	3	1	3				1		1	3	1	
II	218COE13	Internetworking Multimedia	3	2	3	1	3				1		1	3	1	
II	218COE14	DSP Processor Architecture and Programming	3	2	3	1	3				1		1	3	1	
II	218COE15	Error Control Coding	3	2	3	1	3				1		1	3	1	
II	218COE16	Smart Antennas	3	2	3	1	3				1		1	3	1	
II	218COE17	Cognitive Radio	3	2	3	1	3				1		1	3	1	
II	218COE18	Ultra Wide Band Communication	3	2	3	1	3				1		1	3	1	
III	318COP01	Project Work (Phase – I)	3	2	3	2	2	1	1	1	1	1	1	3	2	1
III	318COP02	Internship	3	2	3	2	2	1	1	1	1	1	1	3	2	1
III	318COE01	Embedded Systems for Communication	3	2	1						1		1	3	1	
III	318COE02	Speech and Audio Signal Processing	3	2	1						1		1	3	1	
III	318COE03	Communication Network Security	3	2	1						1		1	3	1	
III	318COE04	High Speed Switching Architecture	3	2	1						1		1	3	1	

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

Sem	Course Code	Course Name	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
III	318COE05	OFDM for Communication Systems	3	2	1						1		1	3	1	
III	318COE06	Beamforming in Wireless Communication	3	2	1						1		1	3	1	
III	318COE07	Simulation of Communication Systems and Networks	3	2	1						1		1	3	1	
III	318COE08	High Performance Communication Networks	3	2	1						1		1	3	1	
III	318COE09	Electromagnetic Interference and Compatibility in System Design	3	2	1						1		1	3	1	
III	318COE10	RF MEMS	3	2	1						1		1	3	1	
III	318COE11	Optical Signal Processing	3	2	1						1		1	3	1	
III	318COE12	Advanced Mobile Computing	3	2	1						1		1	3	1	
III	318COE13	Ad Hoc Network	3	2	1						1		1	3	1	
III	318COE14	Advanced Techniques for Wireless Reception	3	2	1						1		1	3	1	
III	318COE15	Wavelets and Mutiresolution Processing	3	2	1						1		1	3	1	
III	318COE16	Soft Computing	3	2	1						1		1	3	1	
III	318COE17	Information Theory and Coding	3	2	1						1		1	3	1	
III	318COE18	Spread Spectrum Communications	3	2	1						1		1	3	1	
IV	418COP01	Project Work (Phase – II)	3	2	3	2	2	1	1	1	1	1	1	3	2	1

PRINCIPAL

Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

ADHIYAMAAN COLLEGE OF ENGINEERING

[An Autonomous Institution Affiliated to Anna University, Chennai]
[Accredited by NAAC]
REGULATIONS 2018
CHOICE BASED CREDIT SYSTEM
M.E- COMMUNICATION SYSTEMS

CURRICULA AND SYLLABI FOR SEMESTERS I TO IV

SEMESTER I

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PERWEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	118COT01	Applied Mathematics	FCC	3	0	0	3	3
2	118COT02	Advanced Digital Signal Processing	PCC	3	0	0	3	3
3	118COT03	Modern Digital Communication Techniques	PCC	3	0	0	3	3
4	118COT04	Optical and Mobile Communication Networks	PCC	3	0	0	3	3
5	118COT05	Advanced Radiation Systems	PCC	3	0	0	3	3
6	118COEXX	Professional Elective-I	PEC	3	0	0	3	3
PRACTICALS								
7	118COP01	Communication Systems Laboratory-I	PCC	0	0	2	2	1
Total				18	0	2	20	19

List of Subjects for Professional Elective I

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	118COE01	Reconfigurable Computing	PEC	3	0	0	3	3
2	118COE02	Network Management	PEC	3	0	0	3	3
3	118COE03	Research Methodology	PEC	3	0	0	3	3
4	118COE04	Wavelet Signal Processing	PEC	3	0	0	3	3
5	118COE05	WDM Optical Networks	PEC	3	0	0	3	3
6	118COE06	Advanced Satellite Based Systems	PEC	3	0	0	3	3

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

SEMESTER II

S. NO.	COURSECODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	218COT01	Software Radio Architecture	PCC	3	0	0	3	3
2	218COT02	Photonic and Microwave Integrated Circuits	PCC	3	0	0	3	3
3	218COT03	Multimedia Compression Techniques	PCC	3	0	0	3	3
4	218COEXX	Professional Elective II	PEC	3	0	0	3	3
5	218COEXX	Professional Elective III	PEC	3	0	0	3	3
6	218COEXX	Professional Elective IV	PEC	3	0	0	3	3
PRACTICALS								
7	218COP01	Communication Systems Laboratory - II	PCC	0	0	2	2	1
			TOTAL	18	0	0	20	19

List of Subjects for Professional Elective II, III, IV

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PERWEEK			TOTAL CONTACT PERIODS	CRE DITS
				L	T	P		
THEORY								
1	218COE01	RF System Design	PEC	3	0	0	3	3
2	218COE02	Advanced Microwave Systems	PEC	3	0	0	3	3
3	218COE03	Communication Protocol Engineering	PEC	3	0	0	3	3
4	218COE04	Global Positioning Systems	PEC	3	0	0	3	3
5	218COE05	Analysis and Design of Planar Transmission Lines	PEC	3	0	0	3	3
6	218COE06	Mixed - Signal Circuit Design	PEC	3	0	0	3	3
7	218COE07	Network Routing Algorithms	PEC	3	0	0	3	3
8	218COE08	Digital Communication Receivers	PEC	3	0	0	3	3
9	218COE09	Advanced Microprocessors and Microcontrollers	PEC	3	0	0	3	3
10	218COE10	Advanced Digital Image Processing	PEC	3	0	0	3	3
11	218COE11	Spectral Analysis of Signals	PEC	3	0	0	3	3
12	218COE12	Detection and Estimation theory	PEC	3	0	0	3	3
13	218COE13	Internetworking Multimedia	PEC	3	0	0	3	3
14	218COE14	DSP Processor Architecture and Programming	PEC	3	0	0	3	3
15	218COE15	Error Control Coding	PEC	3	0	0	3	3
16	218COE16	Smart Antennas	PEC	3	0	0	3	3
17	218COE17	Cognitive Radio	PEC	3	0	0	3	3
18	218COE18	Ultra Wide Band Communication	PEC	3	0	0	3	3

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

SEMESTER III

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	318COEXX	Professional Elective V	PEC	3	0	0	3	3
2	318COEXX	Professional Elective VI	PEC	3	0	0	3	3
3	318COEXX	Professional Elective VII	PEC	3	0	0	3	3
PRACTICALS								
4	318COP01	Project Work (Phase – I)	EEC	0	0	14	14	7
5	318COP02	Internship	EEC	-	-	-		1
			Total	9	0	14	23	17

List of Subjects for Professional Elective V, VI, VII

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	318COE01	Embedded Systems for Communication	PEC	3	0	0	3	3
2	318COE02	Speech and Audio Signal Processing	PEC	3	0	0	3	3
3	318COE03	Communication Network Security	PEC	3	0	0	3	3
4	318COE04	High Speed Switching Architecture	PEC	3	0	0	3	3
5	318COE05	OFDM for Communication Systems	PEC	3	0	0	3	3
6	318COE06	Beamforming in Wireless Communication	PEC	3	0	0	3	3
7	318COE07	Simulation of Communication Systems and Networks	PEC	3	0	0	3	3
8	318COE08	High Performance Communication Networks	PEC	3	0	0	3	3
9	318COE09	Electromagnetic Interference and Compatibility in System Design	PEC	3	0	0	3	3
10	318COE10	RF MEMS	PEC	3	0	0	3	3
11	318COE11	Optical Signal Processing	PEC	3	0	0	3	3
12	318COE12	Advanced Mobile Computing	PEC	3	0	0	3	3
13	318COE13	Ad Hoc Network	PEC	3	0	0	3	3
14	318COE14	Advanced Techniques for Wireless Reception	PEC	3	0	0	3	3
15	318COE15	Wavelets and Mutiresolution Processing	PEC	3	0	0	3	3
16	318COE16	Soft Computing	PEC	3	0	0	3	3
17	318COE17	Information Theory and Coding	PEC	3	0	0	3	3
18	318COE18	Spread Spectrum Communications	PEC	3	0	0	3	3

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

SEMESTER IV

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1	418COP01	Project Work (Phase – II)	EEC	0	0	30	15	15
			Total	0	0	30	15	15

Allocation of Credits:

Semester	I	II	III	IV
Credit	19	19	17	15
Total	70			

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

118COT01 **APPLIED MATHEMATICS** **L T P C**

3 0 0 3

UNIT I LINEAR ALGEBRAIC EQUATION AND EIGEN VALUE PROBLEMS 9

System of equations – Solution by Gauss Elimination, Gauss – Jordan and LU decomposition method – Jacobi, Gauss – Seidel iteration method – Eigen values of a matrix by Jacobi and power method

UNIT II WAVE EQUATION 9

Solution of initial and boundary value problems – Characteristics – D'Alembert's solution – Laplace transform solutions for displacement in a long string - a long string under its weight – a bar with prescribed force on one end – free vibrations of a string.

UNIT III SPECIAL FUNCTIONS 9

Bessel's equation – Bessel Functions – Legendre's equation – Legendre polynomials – Rodrigue's formula – Recurrence relations – generating functions and orthogonal property for Bessel functions – Legendre polynomials.

UNIT IV RANDOM VARIABLES 9

One dimensional Random Variable – Moments and MGF – Binomial, Poisson, Geometrical, Normal Distributions - Two dimensional random variables – Marginal and Conditional Distributions – Covariance and Correlation coefficient.

UNIT V QUEUEING THEORY 9

Introduction-Characteristics of Queueing Models- Little's Formula- Markovian Single server and multi server queuing models: Model I: (M/M/1): (∞ **/FIFO**) , Model II: (M/M/s): (∞ **/FIFO**) , Model III: (M/M/1): (**k/FIFO**) , Model IV: (M/M/s): (**k/FIFO**) -- (M/G/1) Queueing Syatem- Pollaczek Khinchin formula.

Total Hours: 45 Periods

REFERENCE(S) :

1. Grewal. B.S, "Higher Engineering Mathematics", Khanna Publications, Delhi, (2012).
2. Sankara Rao. K. "Introduction to partial differential equation" PHI,2010.
3. Taha, H.A., "Operations Research – An Introduction "6th Edition, PHI,2011.
4. Jain, M.K.Iyengar, S.R.K. &Jain R.K..," International methods for Scientific and Engineering Computation " New Age International (p)Ltd, Publishers,2012 .
5. Kanpur J.N.& Saxena.H.C "Mathematical Statistics", S.Chand & Co., New Delhi,2013.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

118COT02 **ADVANCED DIGITAL SIGNAL PROCESSING** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- Understand the concept of signals in frequency domain.
- Estimate the signal spectrum by parametric and Non-Parametric approach.
- Design and analysis of filtering functions.
- Understand the concept of Adaptive filters.
- Apply multirate signal processing in various applications.

UNIT I DISCRETE RANDOM SIGNAL PROCESSING 9

Discrete Random Processes- Ensemble averages, stationary processes, Autocorrelation and Auto covariance matrices. Parseval's Theorem, Wiener-Khintchine Relation- Power Spectral Density-Periodogram, Spectral Factorization, Filtering random processes.Low Pass Filtering of White Noise. Parameter estimation: Bias and consistency.

UNIT II SPECTRUM ESTIMATION 9

Estimation of spectra from finite duration signals, Non-Parametric Methods-Correlation Method , Periodogram Estimator, Performance Analysis of Estimators -Unbiased, Consistent Estimators-Modified periodogram, Bartlett and Welch methods, Blackman –Tukey method. Parametric Methods - AR, MA, ARMA model based spectral estimation. Parameter Estimation -Yule-Walker equations, solutions using Durbin's algorithm**.**

UNIT III LINEAR ESTIMATION AND PREDICTION 9

Linear prediction- Forward and backward predictions, Solutions of the Normal equations- Levinson-Durbin algorithms. Least mean squared error criterion -Wiener filter for filtering and prediction , FIR Wiener filter and Wiener IIR filters ,Discrete Kalman filter

UNIT IV ADAPTIVE FILTERS 9

FIR adaptive filters -adaptive filter based on steepest descent method-Widrow-Hoff LMS adaptive algorithm, Normalized LMS. Adaptive channel equalization-Adaptive echo cancellation-Adaptive noise cancellation- Adaptive recursive filters (IIR). RLS adaptive filters-Exponentially weighted RLS-sliding window RLS.

UNIT V MULTIRATE DIGITAL SIGNAL PROCESSING 9

Mathematical description of change of sampling rate - Interpolation and Decimation , Decimation by an integer factor - Interpolation by an integer factor, Sampling rate conversion by a rational factor, Filter implementation for sampling rate conversion- Direct form FIR structures, Polyphase filter structures, time-variant structures. Multistage implementation of multirate system. Application to sub band coding - Wavelet transform and filter bank implementation of wavelet expansion of signals.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1: Analyze the discrete signal parameters in time and frequency domain.

CO2: Estimate statistical parameter of the signal in frequency domain.

CO3: Estimate and predict the different forms of signals.

CO4: Design and develop Adaptive filters.

CO5: Implement Sub-band coding for various Applications.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

REFERENCE BOOKS

1. Monson H.Hayes, Statistical Digital Signal Processing and Modeling, John Wiley and Sons, Inc.,Singapore, 2002
2. John G.Proakis, DimitrisG.Manolakis, Digital Signal Processing Pearson Education, 2002
3. G.M.REBEIZ, RF MEMS Theory, Design and Technology, John Wiley, 2003.
4. John G.Proakiset.al.,'Algorithms for Statistical Signal Processing', Pearson Education, 2002
5. DimitrisG.Manolakiset.al.,'Statistical and adaptive signal Processing', McGraw Hill, Newyork,2000
6. Rafael C. Gonzalez, Richard E.Woods, 'Digital Image Processing', Pearson Education, Inc., Second Edition, 2004.(For Wavelet Transform Topic)

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Analyze the discrete signal parameters in time and frequency domain.	3	2	3	1	3				1		3	3	1	
Co2	Estimate statistical parameter of the signal in frequency domain.	3	2	3	1	3				1		3	3	1	
Co3	Estimate and predict the different forms of signals.	3	2	3	1	3				1		3	3	1	
Co4	Design and develop Adaptive filters.	3	2	3	1	3				1		3	3	1	
Co5	Implement Sub-band coding for various Applications.	3	2	3	1	3				1		3	3	1	

118COT03 MODERN DIGITAL COMMUNICATION TECHNIQUE L T P C

3 0 0 3

COURSE OBJECTIVES

- To extend the theory of Constant envelope modulation to M-ary schemes and to familiarize the concept of Spread Spectrum.
- To develop the mathematical and algorithmic foundations of the error detecting and error correcting codes used in modern communications systems.

UNIT I DETECTION AND ESTIMATION 9

Pass band Transmission model - Gram Schmidt orthogonalization procedure, Geometric Interpretation of signals, Response of bank of correlators to a noisy input-Coherent detection of signals in noise, Probability of error - Correlation Receiver - Matched Filter - Detection of signals with unknown phase.

UNIT II CONSTANT ENVELOPE MODULATION 9

Advantages of Constant Envelope Modulation - Minimum Shift Keying- Gaussian Minimum Shift Keying - M-ary Phase Shift Keying - M-ary Quadrature Amplitude Modulation - M-ary Frequency Shift Keying - Non Coherent modulation Techniques.

UNIT III CONVOLUTIONAL CODING 9

Representation of codes using Polynomial - State diagram - Tree diagram - and Trellis diagram, Decoding techniques: Maximum likelihood decoding - Viterbi algorithm- Sequential decoding Coded modulation for bandwidth constrained channels.

Trellis coded modulation : Set Partitioning - Four state trellis - coded modulation with 8-PSK signal constellation - Eight state trellis code for coded 8-PSK modulation - Eight state trellis for rectangular QAM signal constellations.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

UNIT IV TURBO CODING 9

Introduction - Turbo Encoder -Turbo Decoder-Iterative Turbo Decoding Principles-Modifications of the MAP Algorithm - The Soft-Output Viterbi Algorithm (SOVA) -Turbo Coded BPSK Performance over Gaussian channels -Turbo Coding Performance over Rayleigh Channels.

UNIT V SPREAD SPECTRUM SIGNALS FOR DIGITAL COMMUNICATION 9

Model of spread Spectrum Digital Communication System - Direct Sequence Spread Spectrum Signals - Error rate performance of the decoder - Generation of PN Sequences and its properties, Frequency Hopped Spread Spectrum Signals - Performance of FH Spread Spectrum Signals in an AWGN Channel - CDMA system based on FH spread spectrum signals - Synchronization of Spread Spectrum Systems.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Apply Digital communication technologies in a variety of engineering applications
CO2: Identify the major classes of error detecting and error correcting codes and how they are used in practice.
CO3: Implement Error control coding and Digital modulation techniques in MATLAB
CO4: Apply Spread Spectrum Techniques in Wireless Communication Technologies
CO5: Understand about the spread spectrum techniques

REFERENCE BOOKS

1. Simon Haykin, “Digital Communications”, John Wiley and sons, Reprint 2009
2. Simon Haykin, “Digital Communication System”, Wiley Student Edition, First Edition, 2013
3. L. Hanzo, T.H. Liew & B.L. Yeap, “Turbo Coding, Turbo Equalization & Space-Time Coding”, Wiley, First Edition, 2002
4. John G. Proakis, “Digital Communication”, McGraw Hill Publication, Fourth Edition, 2001
5. S.Lin & D.J.Costello, Error Control Coding (2/e) Pearson, 2005
6. Theodore S.Rappaport, “Wireless Communications”, Pearson Education, Second Edition 2002.
7. Stephen G. Wilson, “Digital Modulation and Coding”, Pearson Education, First Indian Reprint, 2003.
8. Rodger E. Ziemer, Roger L. Peterson, David E. Borth, “Introduction to Spread Spectrum Communications”, Prentice Hall, First Edition, 1995.
9. Nptel Lecture: http://aicte-stream/

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Apply Digital communication technologies in a variety of engineering applications	**3**	**2**	**3**	**1**	**3**				**1**		**3**	**1**		**1**
Co2	Identify the major classes of error detecting and error correcting codes and how they are used in practice.	**3**	**2**	**3**	**1**	**3**				**1**		**3**	**1**		**1**
Co3	Implement Error control coding and Digital modulation techniques in MATLAB	**3**	**2**	**3**	**1**	**3**				**1**		**3**	**1**		**1**
Co4	Apply Spread Spectrum Techniques in Wireless Communication Technologies	**3**	**2**	**3**	**1**	**3**				**1**		**3**	**1**		**1**
Co5	Understand about the spread spectrum techniques	**3**	**2**	**3**	**1**	**3**				**1**		**3**	**1**		**1**

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

118COT04 OPTICAL AND MOBILE COMMUNICATION NETWORK L T P C

3 0 0 3

COURSE OBJECTIVES

- Devise in functionalities of various optical components and networking architectures like SONET / SDH used in Optical Networking
- Quote for cost effective laying of Access networks like Fiber to the Home in India.
- Recite make familiarize about MIMO and broadcast systems
- Read evaluate the performance of wireless networks

UNIT I OPTICAL SYSTEM COMPONENTS 9

Light propagation in optical fibers - Loss & bandwidth, Dispersion effects, Non-Linear effects; Solitons - Optical Network Components - Couplers, Isolators & Circulators, Multiplexers & Filters, Optical Amplifiers, Switches, Wavelength Converters.

UNIT II OPTICAL NETWORK ARCHITECTURES 9

Introduction to Optical Networks: SONET / SDH standards, Metropolitan Area Networks, Layered Architecture - Broadcast and Select Networks - Topologies for Broadcast Networks, Media Access Control Protocols, Test beds for Broadcast & Select WDM; Outline of Wavelength Routing Architecture

UNIT III MIMO COMMUNICATIONS 9

Propagation of EM signals in wireless channel – Reflection, diffraction and Scattering-Small scale fading- channel classification- channel models – COST -231 Hata model, Longley-Rice Model,NLOS Multipath Fading Models: Rayleigh, Rician, Nakagami, Composite Fading –shadowingDistributions, Link power budget Analysis.

UNIT IV BROADCAST SYSTEMS 9

Narrowband MIMO model, Parallel decomposition of the MIMO channel, MIMO channel capacity, MIMO Diversity Gain:Beamforming, Diversity-Multiplexing trade-offs, Space time Modulation and coding : STBC,STTC, Spacial Multiplexing and BLAST Architectures.

UNIT V WIRELESS NETWORKS 9

3G Overview, Migration path to UMTS, UMTS Basics, Air Interface, 3GPP Network Architecture,4G features and challenges, Technology path, IMS Architecture - Introduction to wireless LANs -IEEE 802.11 WLANs - Physical Layer- MAC sublayer.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Recall knowledge of basic optical components for realizing any optical function
CO2: Discuss and formulate different networking Topologies.
CO3: Design and analyze about MIMI communication system and Broadcast system
CO4: Summarize the functioning of wireless networks
CO5: Understand about wireless networks

REFERENCE BOOKS

1. Rajiv Ramaswami and Kumar N. Sivarajan, “Optical Networks : A Practical Perspective”, Harcourt Asia Pvt. Ltd., Second Edition 2004.
2. Biswanath Mukherjee, “Optical Communication Networks”, Mc-GrawHill ©1997, First Edition ISBN 0-07-044435-8
3. Rappaport. T.S., “Wireless communications”, Pearson Education, 2003

4. KavethPahlavan,. K. PrashanthKrishnamuorthy, "Principles of Wireless Networks", Prentice Hall of India, 2006.
5. Clint Smith. P.E., and Daniel Collins, “3G Wireless Networks”, 2nd Edition, Tata McGraw Hill, 2007
6. Vijay. K. Garg, “Wireless Communication and Networking”, Morgan Kaufmann Publishers, http://books.elsevier.com/9780123735805:, 2007
7. William Stallings, "Wireless Communications and networks" Pearson / Prentice Hall of India,2nd Ed., 2007

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Recall knowledge of basic optical components for realizing any optical function	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co2	Discuss and formulate different networking Topologies	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co3	Design and analyze about MIMI communication system and Broadcast system	**3**	**2**	**3**	**1**	**3**				**1**		**3**	**1**		**1**
Co4	Summarize the functioning of wireless networks	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co5	Understand about wireless networks	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**

118COT05 **Advanced Radiation Systems** **L T P C**

3 0 0 3

COURSE OBJECTIVES:

- Understand the concept of Retarded vector potential with Heuristic and Maxwell’s equation approach.
- Describe the concept of Antenna Arrays with different types and their pattern multiplication
- Examine the different Antenna synthesis method
- Design different types of Antennas with their characteristic
- Compare all the special antennas with their applications.

UNIT I ANTENNA FUNDAMENTALS 9

Antenna fundamental parameters, Radiation integrals, Radiation from surface and line current distributions -Introduction to numerical techniques- FEM, FDTD, MoM. Linear array -uniform array, end fire and broad side array, gain, beam width, side lobe level- Two dimensional uniform array- Phased array, beam scanning, grating lobe, feed network

UNIT II RADIATION FROM APERTURES 9

Field equivalence principle, Radiation from Rectangular and Circular apertures, Uniform aperture distribution on an infinite ground plane; Slot antenna; Horn antenna-Reflector antenna, aperture blockage, and design consideration.

UNIT III ANTENNA SYNTHESIS 9

Synthesis problem-Line source based beam synthesis methods - Fourier transform and Woodward-Lawson sampling method – Linear array shaped beam synthesis method – Low side lobe, narrow main beam synthesis methods - discretization of continuous sources. Schelkunoff polynomial method

UNIT IV MICRO STRIP ANTENNA 9

Radiation Mechanism from patch - Excitation techniques; Microstrip dipole; Rectangular patch, Circular patch, and Ring antenna - radiation analysis from cavity model - input impedance of rectangular and circular patch antenna - Microstrip array and feed network - Application of microstrip array antenna.

UNIT V SPECIAL ANTENNAS 9

Need of metamaterial structures, Advantages of metamaterial structures. Design of the metamaterial antennas, Fractal antennas, polarization sensitive antenna design, sinuous antennas, EBG structure, PBG structures. CNT antennas.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

CO1: Calculate the Power radiated in far field and also familiar with Polarization concept.
CO2: Apply Antenna Arrays with N elements for specified Application
CO3: Summarize the Antenna based on their Specification and Performance, for various Applications
CO4: Categorize the micro strip antennas for different applications.
CO5: Understand about Special antennas

REFERENCE BOOKS

1. Balanis, C.A., "Antenna Theory" Wiley,2003
2. Warren L. Stutzman and Gary A. Thiele," Antenna theory and design"John Wiley and sons 1998
3. Jordan, E.C., " Electromagnetic waves and Radiating systems". PHI 2003
4. Krauss, J.D., " Radio Astronomy" McGraw-Hill 1966, for the last unit (reprints available)
5. Krauss, J.D.,, Fleisch,D.A., "Electromagnetics" McGraw-Hill,1999

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Calculate the Power radiated in far field and also familiar with Polarization concept	**3**	**2**	**1**	1		1			**1**		**3**	**1**		**1**
Co2	Apply Antenna Arrays with N elements for specified Application	**3**	**2**	**1**	1		1			**1**		**3**	**1**		**1**
Co3	Summarize the Antenna based on their Specification and Performance, for various Applications	**3**	**2**	**1**	1		1			**1**		**3**	**1**		**1**
Co4	Categorize the micro strip antennas for different applications	**3**	**2**	**1**	1		1			**1**		**3**	**1**		**1**
Co5	Understand about Special antennas	**3**	**2**	**1**	1		1			**1**		**3**	**1**		**1**

118COP01 COMMUNICATION SYSTEMS LABORATORY- I L T P C
0 0 4 2

COURSE OBJECTIVES

- Determine and analyse the radiation pattern of the various antenna.
- Explain the design and simulation of the modulation and coding
- Analyse the various applications of the optical communication.
- Create and analyse channel equalizer and OFDM transceivers using MATLAB.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

LIST OF EXPERIMENTS

1. Antenna Radiation Pattern measurement.
2. Simulation of Modulation and Coding in a AWGN Communication Channel using Simulation Packages.
3. Implementation of Adaptive Filters, periodogram and multistage multirate system in DSP Processor
4. Performance evaluation of Digital Data Transmission through Fiber Optic Link.
5. Study of Spread Spectrum Techniques.
6. Simulation of QMF using Simulation Packages.
7. Implementation of Video Link using Optical Fiber.
8. Implementation of Linear and Cyclic Codes.
9. OFDM transreceiver design using MATLAB
10. Channel equalizer design using MATLAB

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

CO1: Analyse the radiation pattern of various antenna's in the polar graphs.
CO2: Design the modulation and coding in different applications.
CO3: Discover the video links and digital data transmission using optical fibres.
CO4: Reproduce sim links models of the OFDM and channel equalizer.

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O 1	PS O 2	PS O 3
Co1	Analyse the radiation pattern of various antenna's in the polar graphs.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co2	Design the modulation and coding in different applications	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co3	Discover the video links and digital data transmission using optical fibres.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co4	Reproduce sim links models of the OFDM and channel equalizer.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**

118COE01 RECONFIGURABLE COMPUTING L T P C
3 0 0 3

COURSE OBJECTIVES

- Expose the students to various device architectures
- Examine the various reconfigurable computing systems
- Understand the different types of computer models for programming reconfigurable architectures
- Expose the students to the various placement and routing protocols

UNIT I DEVICE ARCHITECTURE 9

General Purpose Computing Vs Reconfigurable Computing – Simple Programmable Logic Devices– Complex Programmable Logic Devices –FPGAs– Device Architecture-Case Studies.

UNIT II RECONFIGURABLE COMPUTING ARCHITECTURES AND SYSTEMS 9

Reconfigurable Processing Fabric Architectures–RPF Integration into Traditional Computing Systems Reconfigurable Computing Systems– Case Studies– Reconfiguration Management.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

UNIT III PROGRAMMING RECONFIGURABLE SYSTEMS 9

ComputeModels-ProgrammingFPGAApplicationsinHDL–CompilingCforSpatialComputing – Operating System Support for Reconfigurable Computing.

UNIT IV MAPPING DESIGNS TO RECONFIGURABLE PLATFORMS 9

The Design Flow - Technology Mapping – FPGA Placement and Routing – Configuration Bit stream Generation–Case Studies with Appropriate Tools.

UNIT V APPLICATION DEVELOPMENT WITH FPGA 9

Case Studies of FPGA Applications–System on a Programmable Chip (SOPC)Designs.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Identify the need for reconfigurable architectures
CO2: Discuss the architecture of FPGAs
CO3: Develop applications using any HDL and appropriate tools
CO4: Design and build an SoPC for a particular application

REFERENCE BOOKS

1. MayaB.GokhaleandPaulS.Graham,"ReconfigurableComputing:AcceleratingComputation with Field-Programmable Gate Arrays", Springer,2005
2. Scott Hauck and Andre Dehon (Eds.),"Reconfigurable Computing the Theory and Practice of FPGA-Based Computation", Elsevier/MorganKaufmann,2008
3. Christophe Bobda, "Introduction to Reconfigurable Computing Architectures, Algorithms and Applications", Springer, 2010.

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PSO 1	PSO 2	PSO 3
Co1	Identify the need for reconfigurable architecture	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co2	Discuss the architecture of FPGAs	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co3	Develop applications using any HDL	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co4	Mapping of technology, FPGA Placement and Routing and case Studies with appropriate tools	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co5	Design and build an SoPC for a particular application	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**

118COE02 NETWORK MANAGEMENT L T P C

3 0 0 3

COURSE OBJECTIVES

- Explain the need for inter operable network management
- State the concepts and architecture behind standards based network management
- Identifythe concepts and terminology associated with SNMP
- Interpret the various broad band network and services
- Summarize the current trends in network management technologies

UNIT I FUNDAMENTALS OF COMPUTER NETWORK TECHNOLOGY 9

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

Network Topology, LAN, Network node components- Hubs, Bridges, Routers, Gateways, Switches, WAN, ISDN Transmission Technology ,Communications protocols and standards. Network Management: Goals, Organization, and Functions, Network and System Management, Network Management System Platform, Current Status and future of Network

UNIT II OSI NETWORK MANAGEMENT 9

OSI Network management model-Organizational model-Information model, communication model. Abstract Syntax Notation - Encoding structure, Macros Functional model CMIP/CMIS

UNIT III INTERNET MANAGEMENT(SNMP) 9

SNMP(V1 and V2)-Organizational model-System Overview, The information model, communication model-Functional model, SNMP proxy server, Management information, protocol remotemonitoring-,RMONSMIandMIB,RMON1,RMON2-ACaseStudyofInternetTraffic Using RMON

UNIT IV BROADBAND NETWORK MANAGEMENT 9

Broadband networks and services, ATM Technology-VP,VC, ATM Packet, Integrated service, ATMLAN emulation, Virtual Lan. ATM Network Management-ATM Network reference model, integrated local management Interface. ATM Management Information base, Role of SNMD and ILMI in ATM Management, M1, M2, M3, M4 Interface.ATM Digital Exchange Interface Management-,TMN conceptual Model-TMN Architecture, TMN Management Service Architecture.

UNIT V NETWORK MANAGEMENT APPLICATIONS 9

Configuration management, Fault management, performance management, Event Correlation Techniques security Management, Accounting management, Report Management, Policy Based Management Service Level Management- Network Management Tools, Network Statistics Measurement Systems –Web Based Management ,XML Based Network Management - : Future Directions.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Analyze the issues and challenges pertaining to management of emerging network technologies such as wired/wireless networks and high-speed internets
CO2: Formulate possible approaches for managing OSI network model.
CO3: Apply network management standards to manage practical networks.
CO4: Prescribe the services offered by broad band networks
CO5: Identify the various components of network and formulate the scheme for the managing them

TEXT BOOKS

1. Mani Subramanian, “NetworkManagementPrinciplesandpractice", PearsonEducation,New Delhi,2010

REFERENCE BOOKS

- STALLINGS,WILLIAM,“SNMP,SNMPv2,SNMPv3,andRMON 1and2,”PearsonEducation,
- 2012
- Salah Aiidarous, Thomas Plevayk,“Tele communications Network Management
- Technologies and Implementations", eastern Economy Edition IEEE press, New Delhi,1998
- LakshmiG. Raman, “Fundamentalsof TelecommunicationNetworkManagement ",Eastern
- Economy Edition IEEE Press, NewDelhi,1999

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Analyze the issues and challenges pertaining to management of emerging network technologies such as wired/wireless networks and high-speed internets	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co2	Formulate possible approaches for managing OSI network model.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co3	Apply network management standards to manage practical networks.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co4	Prescribe the services offered by broad band networks	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co5	Identify the various components of network and formulate the scheme for the managing them.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**

118COE03 **RESEARCH METHODOLOGY** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Understand the concept of Qualitative and Quantitative Research
- Experiment the Design and Testing concepts for Research
- Learn the concept of Data Collection and Statistical Techniques
- Learn the concept of Report Making

UNIT I INTRODUCTION TO RESEARCH **9**

The hallmarks of scientific research – Building blocks of science in research – Concept of Applied and Basic research – Quantitative and Qualitative Research Techniques – Need for theoretical frame work – Hypothesis development – Hypothesis testing with quantitative data. Research design – Purpose of the study: Exploratory, Descriptive, Hypothesis Testing.

UNIT II EXPERIMENTAL DESIGN **9**

Laboratory and the Field Experiment – Internal and External Validity – Factors affecting Internal validity. Measurement of variables – Scales and measurements of variables. Developing scales – Rating scale and attitudinal scales – Validity testing of scales – Reliability concept in scales being developed – Stability Measures.

UNIT III DATA COLLECTION METHODS **9**

Interviewing, Questionnaires, etc. Secondary sources of data collection. Guidelines for Questionnaire Design – Electronic Questionnaire Design and Surveys. Special Data Sources: Focus Groups, Static and Dynamic panels. Review of Advantages and Disadvantages of various Data-Collection Methods and their utility. Sampling Techniques – Probabilistic and non-probabilistic samples. Issues of Precision and Confidence in determining Sample Size. Hypothesis testing, Determination of Optimal sample size.

UNIT IV MULTIVARIATE STATISTICAL TECHNIQUES **9**

Data Analysis – Factor Analysis – Cluster Analysis – Discriminant Analysis – Multiple Regression and Correlation – Canonical Correlation – Application of Statistical (SPSS) Software Package in Research.

UNIT V RESEARCH REPORT **9**

Purpose of the written report – Concept of audience – Basics of written reports. Integral parts of a report – Title of a report, Table of contents, Abstract, Synopsis, Introduction, Body of a report –

Experimental, Results and Discussion – Recommendations and Implementation section – Conclusions and Scope for future work.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Understand the concept of Qualitative and Quantitative Research
CO2: Experiment the Design and Testing concepts for Research
CO3: Knowledge in concept of Data Collection and Statistical Techniques
CO4: Knowledge in concept of Statistical Techniques
CO5: Knowledge in Learn the concept of Report Making

REFERENCE BOOKS

1. Donald R. Cooper and Ramela S. Schindler, Business Research Methods, Tata McGraw- Hill Publishing Company Limited, New Delhi, 2000
2. Uma Sekaran, Research Methods for Business, John Wiley and Sons Inc., New York, 2000
3. C.R.Kothari, Research Methodology, WishvaPrakashan, New Delhi, 2001
4. Donald H.McBurney, Research Methods, Thomson Asia Pvt. Ltd. Singapore, 2002
5. G.W.Ticehurst and A.J.Veal, Business Research Methods, Longman, 1999.
6. Ranjit Kumar, Research Methodology, Sage Publications, London, 1999
7. Raymond-Alain Thie'tart, et.al., Doing Management Research, Sage Publications, London, 1999
8. John Creswell, "Research Design: Qualitative, Quantitative, and Mixed Methods Approaches" SAGE Publications, Inc; Fourth Edition 2013.

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Understand the concept of Qualitative and Quantitative Research	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co2	Experiment the Design and Testing concepts for Research	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co3	Knowledge in concept of Data Collection and Statistical Techniques	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co4	Knowledge in concept of Statistical Techniques	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co5	Knowledge in Learn the concept of Report Making	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**

118COE04 **Wavelet Signal Processing** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Infer the basics of signal representation and Fourier theory
- Explain the principle of non-linear wavelets
- Discuss the wavelet transform in both continuous and discrete domain
- Extend the design of wavelets using Lifting scheme
- Summarize the applications of Wavelet transform

UNIT I FUNDAMENTALS **9**

Vector Spaces – Properties– Dot Product – Basis – Dimension, Orthogonality and Orthonormality – Relationship Between Vectors and Signals – Signal Spaces – Concept of Convergence – Hilbert Spaces

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

for Energy Signals- Fourier Theory: Fourier series expansion, Fourier transform, Short time Fourier transform, Time-frequency analysis

UNIT II MULTI RESOLUTION ANALYSIS 9

Definition of Multi Resolution Analysis (MRA) – Haar Basis – Construction of General Orthonormal MRA – Wavelet Basis for MRA – Continuous Time MRA Interpretation for the DTWT – Discrete Time MRA – Basis Functions for the DTWT – PRQMF Filter Banks.

UNIT III CONTINUOUS WAVELET TRANSFORMS 9

Wavelet Transform – Definition and Properties – Concept of Scale and its Relation with Frequency – Continuous Wavelet Transform (CWT) – Scaling Function and Wavelet Functions (DaubechiesCoiflet, Mexican Hat, Sinc, Gaussian, Bi Orthogonal)– Tiling of Time – Scale Plane for CWT.

UNIT IV DISCRETE WAVELET TRANSFORM 9

Filter Bank and Sub Band Coding Principles – Wavelet Filters – Inverse DWT Computation by Filter Banks – Basic Properties of Filter Coefficients – Choice of Wavelet Function Coefficients – Derivations of Daubechies Wavelets – Mallat's Algorithm for DWT – Multi Band Wavelet Transforms Lifting Scheme- Wavelet Transform Using Polyphase Matrix Factorization – Geometrical Foundations of Lifting Scheme – Lifting Scheme in Z –Domain.

UNIT V APPLICATIONS 9

Wavelet methods for signal processing- Image Compression Techniques: EZW–SPHIT Coding– Image Denoising Techniques: Noise Estimation – Shrinkage Rules – Shrinkage Functions –Edge Detection and Object Isolation, Image Fusion, and Object Detection.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Apply Fourier tools to analyse signals
CO2: Gain knowledge about MRA and representation using wavelet bases
CO3: Acquire knowledge about various wavelet transforms and design wavelet transform.
CO4: Apply wavelet transform for various signal & image processing applications
CO5: Generate the different family of wavelets for real-time applications.

TEXT BOOKS

1. Rao R M and A S Bopardikar, —Wavelet Transforms Introduction to theory and Applications, Pearson Education, Asia, 2000.
2. L.Prasad&S.S.Iyengar, Wavelet Analysis with Applications to Image Processing, CRC Press, 1997.

REFERENCE BOOKS

1. J. C. Goswami and A. K. Chan, “Fundamentals of wavelets: Theory, Algorithms and Applications" WileyIntersciencePublication,John Wiley & Sons Inc., 1999.
2. M. Vetterli, J. Kovacevic, “Wavelets and subband coding" Prentice Hall Inc, 1995.
3. Stephen G. Mallat, “A wavelet tour of signal processing" 2 nd Edition Academic Press
4. C. Sidney Burvus, Ramesh A.Gopinathhaito, “Introduction to wavelets and wavelet Transform”,PrenticeHallInternational,1995.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Apply Fourier tools to analyse signals	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co2	Gain knowledge about MRA and representation using wavelet bases	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co3	Acquire knowledge about various wavelet transforms and design wavelet transform.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co4	Apply wavelet transform for various signal & image processing applications	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co5	Generate the different family of wavelets for real-time applications	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**

118COE05 **WDM OPTICAL NETWORKS** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Categorize Optical System Components
- Extrapolate Optical Network Architecture
- Outline the Wavelength Routing Network,
- Develop skills on Packet Switching Network ,Access Networks
- Interpolate about the Network Design and Management Techniques

UNIT I OPTICAL SYSTEM COMPONENTS 9

Light propagation in optical fibers – Loss & bandwidth, System limitations, Non-Linear effects; Solitons; Optical Network Components – Couplers, Isolators & Circulators, Multiplexers & Filters, Optical Amplifiers, Switches, Wavelength Converters.

UNIT II OPTICAL NETWORK ARCHITECTURES 9

Introduction to Optical Networks; SONET / SDH, Metropoliton-Area Networks, Layered Architecture ; Broadcast and Select Networks – Topologies for Broadcast Networks, Media-Access Control Protocols, Test beds for Broadcast & Select WDM; Wavelength Routing Architecture.

UNIT III WAVELENGTH ROUTING NETWORKS 9

The optical layer, Node Designs, Optical layer cost tradeoff, Routing and wavelength assignment,Virtual topology design, Wavelength Routing Test beds, Architectural variations.

UNIT IV PACKET SWITCHING AND ACCESS NETWORKS 9

Photonic Packet Switching – OTDM, Multiplexing and Demultiplexing, Synchronization, Broadcast OTDM networks, Switch-based networks; Access Networks – Network Architecture overview, Future Access Networks, Optical Access Network Architectures; and OTDM networks.

UNIT V NETWORK DESIGN AND MANAGEMENT 9

Transmission System Engineering – System model, Power penalty - transmitter, receiver, Optical amplifiers, crosstalk, dispersion; Wavelength stabilization ; Overall design considerations; Control and Management – Network management functions, Configuration management, Performance management, Fault management, Optical safety, Service interface.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Apply the Optical System Components worldwide
CO2: Create Optical Network Architecture for reasoning
CO3: Develop skills on Wavelength Routing Network,
CO4: Integrate on Packet Switching Network, Access Network
CO5: Devise and Manage Optical Network for desired Application

TEXT BOOKS

1. Rajiv Ramaswami and Kumar N. Sivarajan, "Optical Networks : A Practical Perspective", Harcourt Asia Pte Ltd., Second Edition 2004

REFERENCE BOOKS

1. C. Siva Ram Moorthy and Mohan Gurusamy, "WDM Optical Networks : Concept,
2. Design and Algorithms", Prentice Hall of India, Ist Edition, 2002
3. P.E. Green, Jr., "Fiber Optic Networks", Prentice Hall, NJ, 1993.

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Apply the Optical System Components worldwide	3	2	3	1	3	1			1		3	1		1
Co2	Create Optical Network Architecture for reasoning	3	2	3	1	3	1			1		3	1		1
Co3	Develop skills on Wavelength Routing Network,	3	2	3	1	3	1			1		3	1		1
Co4	Integrate on Packet Switching Network, Access Network	3	2	3	1	3	1			1		3	1		1
Co5	Devise and Manage Optical Network for desired Application	3	2	3	1	3				1		3	1		1

122COE06 ADVANCED SATELLITE BASED SYSTEMS L T P C

3 0 0 3

COURSE OBJECTIVES

- To Recite the performance of any satellite network
- To Discuss the orbital concepts in navigational systems
- To Complete the GEO sub systems
- To Illustrate the Remote Sensing Data
- To Interpret DTH Services and IPV6

UNIT I NAVIGATION, TRACKING AND SAFETY SYSTEMS 9

Global Navigation Satellite Systems - Basic concepts of GPS. Space segment, Control segment, User segment, GPS constellation, GPS measurement characteristics, Selective Availability (SA), Anti spoofing (AS). Applications of Satellite and GPS for 3D position, Velocity, determination as function of time, Interdisciplinary applications. Regional Navigation Systems - Distress and Safety- COSPAS-SARSAT - INMARSAT Distress System - Location - Based service.

UNIT II INERTIAL NAVIGATION AND DIFFERENTIAL GPS SYSTEMS 9

Introduction to Inertial Navigation - Inertial Sensors - Navigation Coordinates - System Implementations - System - Level Error Models - Introduction to Differential GPS - LADGPS - WADGPS-WAAS - GEO Uplink Subsystem (GUS) - GEO Uplink Subsystem (GUS) Clock Steering Algorithms - GEO Orbit Determination – Problems

UNIT III REMOTE SENSING SYSTEMS AND TECHNIQUES 9

Introduction - Commercial Imaging - DigitalGlobe - GeoEye - Meteorology - Meteosat - Land Observation - Landsat - Remote Sensing Data- Sensors- Overview - Optical Sensors: Cameras- Non-Optical Sensors- Image Processing - Image Interpretation- System Characteristics.

UNIT IV BROADCAST SYSTEMS 9

Introduction - Satellite Radio Systems - XM Satellite Radio Inc. - Sirius Satellite Radio -Worldspace - Direct Multimedia Broadcast- MBCO and TU Multimedia - European Initiatives - Direct-to-Home Television - Implementation Issues - DTH Services- Representative DTH Systems - Military Multimedia Broadcasts - US Global Broadcast Service (GBS)- Business TV(BTV), GRAMSAT, Specialized services - E -mail, Video conferencing, Internet.

UNIT V SATELLITE NETWORKING SYSTEM WITH IPV6 9

Overview of IPv6 and its benefits for Satellite Networks - Migration and Coexistence - IPv6 Addressing Mechanisms - Addresses for Hosts and Routers- IPv6 Infrastructure - Routing and Route Management- Configuration Methods - Dynamic Host Configuration Protocol for IPv6 - IPv6 and Related Protocols - IPv6 Header Format- Traffic Classes.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Analyze different navigational services
CO2: Apply various remote sensing concepts for Safety of Life Services
CO3: Describe the performance of any satellite networks
CO4: Determine the image processing concepts on remote sensing data
CO5:Prescribe IPv6 Addressing Mechanisms

REFERENCE BOOKS

1. Mohinder S. Grewal, “Global Positioning Systems, Inertial Navigation, and Integration.” California State University at Fullerton, A John Wiley & Sons, Inc. Publication, First Edition, 2004
2. Madhavendra Richharia, “Satellite systems for personal Applications” , A John Wiley and Sons, Ltd., Publication, Third Edition, 2010
3. Daniel Minoli, “Satellite Systems Engineering in an IPv6 Environment”, CRC Press, First Edition, 2009
4. Dennis Roddy, “Satellite Communication”, McGraw Hill International, Forth Edition, 2006.
5. Wilbur L. Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, “Satellite Communication Systems Engineering”, Prentice Hall, First Edition, 2007.

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O 1	PS O 2	PS O 3
Co1	Analyze different navigational services	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**2**		**1**
Co2	Apply various remote sensing concepts for Safety of Life Services	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**2**		**1**
Co3	Describe the performance of any satellite networks	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**2**		**1**
Co4	Determine the image processing concepts on remote sensing data	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**2**		**1**
Co5	Prescribe IPv6 Addressing Mechanisms	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**2**		**1**

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

218COT01 **SOFTWARE RADIO ARCHITECTURE** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Study about the Software Defined Radio Architecture.
- Learn the types of ADC and DAC for Software Radio.
- Understand the concepts of Digital Filters.
- Acquire the knowledge on Smart Antenna

UNIT I BASIC SOFTWARE DEFINED RADIO ARCHITECTURE 9

Software Defined Radio–A Traditional Hardware Radio Architecture–Signal Processing Hardware History–Software Defined Radio Project Complexity. 2G Radio Architectures- Hybrid Radio Architecture-Basic Software Defined Radio Block Diagram-System Level Functioning Partitioning-Digital Frequency Conversion Partitioning.

UNIT II ANALOG-TO-DIGITALAND DIGITAL-TO-ANALOG CONVERSION 9

Introduction–Digital Conversion Fundamentals-Sample Rate-Band pass Sampling-Oversampling- Anti alias Filtering– Quantization– ADC Techniques-Successive Approximation-Figure of Merit-DACs-DAC Noise Budget- ADC Noise Budget.

UNIT III DIGITAL FREQUENCY UP AND DOWN CONVERTERS 9

Introduction-Frequency Converter Fundamentals-Digital NCO-Digital Mixers-Digital Filters-Half band Filters-CIC Filters- Decimation, Interpolation and Multi-rate Processing-DUCs-Cascading Digital Converters and Digital Frequency Converters.

UNIT IV HARDWARE COMPONENTS AND SOFTWARE ARCHITECTURE 9

Introduction- SDR Requirements for Processing Power-DSPs-DSP Devices-DSP Compilers-Reconfigurable Processors- Major Software Architecture Choices–Hardware–SpecificSoftware Architecture

UNIT V SMART ANTENNAS USING SOFTWARE RADIO 9

Introduction-3G smart Antenna Requirements- Phased Antenna Array Theory-Applying Software Radio Principles to Antenna Systems- Smart Antenna Architectures-Optimum Combining/Adaptive Arrays-DOA Arrays-Beam Forming for CDMA-Downlink Beam Forming.

TOTAL HOURS : 45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Conceptualize the SDR and implementation details
CO2: Design SDR for a specific application
CO3: Identify the challenges in the maintenance of SDR
CO4: Analyse the transmitter and receiver architectures
CO5: Understand about Smart Antennas using Software radio architecture

REFERENCE BOOKS

1. Paul Burns, SoftwareDefinedRadiofor3G,Artech House, 2002
2. TonyJRouphael, RF and DSPforSDR, ElsevierNewnesPress,2008
3. JoukoVanakka,DigitalSynthesizersandTransmitterforSoftwareRadio,Springer, 2005
4. PKenington,RF and Baseband Techniques forSoftwareDefined Radio,ArtechHouse,2005

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Conceptualize the SDR and implementation details	3	2	3	1	3	1			1		3	1		1
Co2	Design SDR for a specific application	3	2	3	1	3	1			1		3	1		1
Co3	Identify the challenges in the maintenance of SDR	3	2	3	1	3	1			1		3	1		1
Co4	Analyse the transmitter and receiver architectures	3	2	3	1	3	1			1		3	1		1
Co5	Understand about Smart Antennas using Software radio architecture	3	2	3	1	3	1			1		3	1		1

218COT02 PHOTONIC AND MICROWAVE INTEGRATED CIRCUITS L T P C

3 0 0 3

COURSE OBJECTIVES

- Develop a deep insight into modern photonic devices and circuits through a thorough understanding of the underlying physics
- Learn about photonic Integrated circuits and its applications
- Study about the technologies involved in MICs.
- Learn the types and components of Micro-strip.

UNIT I INTRODUCTION TO PHOTONICS 9

Introduction to photonics-Optical waveguide theory- Photonic crystals, Metamaterials, Plosmonics-Photonic components switch ,couplers etc.

UNIT II PHOTONIC INTEGRATED CIRCUIT 9

Introduction to photonic integrated circuits-Fabrication techniques:Lithography,ion-exchange deposition, diffution process and device characteristics-Photonic Band Gap structure-Applications:Micro-Opto-Electro-Mechanical system(MOEMS).-Bio-Photonics.-VLSI Photonics

UNIT III MICROSTRIP COMPONENTS 9

Component using Microstrips: flat resistors – flat inductors – interdigital capacitors – sandwich capacitors – ferromagnetic substrates for non-reciprocal devices – microstrip circulators – latching circulators – isolators – phase shifters

UNIT IV ANALYSIS OF MICROSTRIP LINE 9

Coupled microstrips – even and odd mode analysis – Microstrip directional couplers – branch line couplers – periodic branch line couplers – synchronous branch line couplers. Losses in microstrip.

UNIT V TECHNOLOGY OF MICS 9

HYBRID MICs: Dielectric substrates - thick film technology and materials - thin film technology and materials – methods of testing – encapsulation of devices for MICs – mounting of active devices.
MONOLITHIC MICs: Processes involved in fabrication – epitaxial growth of semiconductor layer – growth of dielectric layer – diffusion-ion implantation – electron beam technology.

TOTAL HOURS : 45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Design the Photonics components.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

CO2: Acquire knowledge in the design and fabrication of the Photonic Integrated Circuits
CO3: Design and fabricate the hybrid MIC's in thick and thin film technology.
CO4: Analyse even and odd mode coupled microstrips.
CO5: Implement the different methods for the fabrication of the monolithic MICs.

REFERENCE BOOKS

1. Gupta,K.C, and Amarjitsingh – "Microwave Integrated Circuits" – John Wiley and sons – Wiley Eastern Reprint, 1978
2. Hoffmann, R.K – "Handbook of Microwave Integrated Circuits" – Artech House, 1987.
3. Ari T.Friberg,and Rene Dandliker-"Advances in Information Optics and photonics"-PHI,Eastern Economy Edition
4. "Integrated Photonics "by C.R.Pollack and M.Lipson

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Design the Photonics components.	3	2	3	1	3	1			1		3	1		1
Co2	Acquire knowledge in the design and fabrication of the Photonic Integrated Circuits	3	2	3	1	3	1			1		3	1		1
Co3	Design and fabricate the hybrid MIC's in thick and thin film technology.	3	2	3	1	3	1			1		3	1		1
Co4	Analyse even and odd mode coupled microstrips.	3	2	3	1	3	1			1		3	1		1
Co5	Implement the different methods for the fabrication of the monolithic MICs	3	2	3	1	3	1			1		3	1		1

218COT03 MULTIMEDIA COMPRESSION TECHNIQUES L T P C

3 0 0 3

COURSE OBJECTIVES

- Learn the basic concepts in the multimedia compression techniques.
- Learn the various algorithms and coding techniques of the text compression.
- Learn the audio compression techniques and its applications.
- Understand the predictive techniques and wavelet based image compressions

UNIT I INTRODUCTION 9

Special features of multimedia – Graphics & Image data representation-Compression techniques-Overview of Source coding-Unique decodable codes, prefix codes, Kraft McMillan inequality-Source modeling –physical model, Probability model, Markov model-Scalar and Vector quantization theory-Evaluation and Error analysis

UNIT II TEXT COMPRESSION 9

Compaction techniques – Huffmann coding – Adaptive Huffmann Coding – Arithmetic coding – Dictionary techniques – LZW family algorithms.

UNIT III AUDIO COMPRESSION 9

Audio compression techniques - μ- Law and A- Law companding. Frequency domain and filtering – Basic sub-band coding – Application to speech coding – G.722 – Application to audio coding – MPEG audio, progressive encoding for audio – speech compression techniques – CELP Vocoders.

UNIT IV IMAGE COMPRESSION 9

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

Predictive techniques – DM, PCM, DPCM: Optimal Predictors and Optimal Quantization– Transform Coding – JPEG Standard – Sub-band coding algorithms: Design of Filter banks – Wavelet based compression: Implementation using filters – EZW, SPIHT coders.

UNIT V VIDEO COMPRESSION 9

Video compression techniques and standards – MPEG Video Coding I: MPEG – 1 and 2 – MPEG Video Coding II: MPEG – 4 and 7 – Motion estimation and compensation techniques – H.261 Standard.

TOTAL HOURS : 45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Understand the various requirements of the multimedia compression techniques.
CO2: Implement text compression using the LZW algorithms and coding techniques.
CO3: Acquire knowledge in the various audio compression techniques and its applications.
CO4: Design and analyze of images compression using wavelet based compression
CO5: Acquire knowledge in the various video compression techniques and its applications

REFERENCE BOOKS

1. Khalid Sayood:Introduction to Data Compression, Morgan Kauffman Harcourt India, 2nd Edition, 2000.
2. David Salomon : Data Compression – The Complete Reference, Springer Verlag New York Inc., 2nd Edition, 2001.
3. Yun Q.Shi, HuifangSun : Image and Video Compression for Multimedia Engineering - Fundamentals, Algorithms & Standards, CRC press, 2003.
4. Peter Symes : Digital Video Compression, McGraw Hill Pub., 2004
5. Mark Nelson : Data compression, BPB Publishers, New Delhi,1998
6. Mark S.Drew, Ze-NianLi : Fundamentals of Multimedia, PHI, 1st Edition, 2003.
7. Watkinson,J : Compression in Video and Audio, Focal press,London.1995.
8. Jan Vozer : Video Compression for Multimedia, AP Profes, NewYork, 1995

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Understand the various requirements of the multimedia compression techniques.	**3**	**2**	**3**	**1**	**3**				**1**		**3**	**1**		**1**
Co2	Implement text compression using the LZW algorithms and coding techniques	**3**	**2**	**3**	**1**	**3**				**1**		**3**	**1**		**1**
Co3	Acquire knowledge in the various audio compression techniques and its applications	**3**	**2**	**3**	**1**	**3**				**1**		**3**	**1**		**1**
Co4	Design and analyze of images compression using wavelet based compression.	**3**	**2**	**3**	**1**	**3**				**1**		**3**	**1**		**1**
Co5	Acquire knowledge in the various video compression techniques and its applications	**3**	**2**	**3**	**1**	**3**				**1**		**3**	**1**		**1**

218COP01 COMMUNICATION SYSTEM LAB II L T P C

0 0 3 1

COURSE OBJECTIVES

- Learn the characteristics of the Non-reciprocal components in micro strip lines.
- Perform image, audio and text compressions.
- Analyze the characteristic parameters of the fiber optic components.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

LIST OF EXPERIMENTS

1. Characteristics of ring resonator(RING) in micro strip
2. Characteristics of a branch line coupler(BLC) in micro strip
3. Characteristics of power divider in micro strip
4. (a)Characteristics of a transformer fed patch antenna in micro strip
   (b)Characteristics of in inset fed patch antenna micro strip
5. Simulation of EZW / SPIHT Image coding algorithm.
6. Implementation of speech processing using Matlab Simulink and Texas instrument processors
7. Study of OTDR(Optical Time Domain Reflectometer)using source of 1550nm laser diode and PIN TIA photo detector.
8. Measurement of attenuation in fiber optic attenuator
9. Measurement of insertion losses and isolation rate in fiber optic isolator.
10. (i).Measurement of insertion losses and coupling co-efficient in fiber optic coupler.
    (ii). Measurement of insertion losses and coupling co-efficient in fiber optic multiplexer

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1:Acquire knowledge in various characteristics of the Non-reciprocal components in micro strip lines.

CO2: Implement the various compression techniques using MATLAB.

CO3: Measure the losses for the fiber optic components

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Acquire knowledge in various characteristics of the Non-reciprocal components in micro strip lines..	**3**	**2**	**3**	**1**	**3**	**1**			**1**		**3**	**1**		**1**
Co2	Implement the various compression techniques using MATLAB	**3**	**2**	**3**	**1**	**3**	**1**			**1**		**3**	**1**		**1**
Co3	Measure the losses for the fiber optic components.	**3**	**2**	**3**	**1**	**3**	**1**			**1**		**3**	**1**		**1**

218COE01 **RF SYSTEM DESIGN** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Study the behaviour of parameters, components and its applications of radio frequency design.
- Study the filter operation in RF design.
- Study the operational characteristics and applications of Active components on RF networks.
- Understand the basic model, characteristic and configuration of oscillator, mixer and its applications.

UNIT I **RF ISSUES** **9**

Importance of RF design, Electromagnetic Spectrum, RF behaviour of passive components, Chip components and Circuit Board considerations, Scattering Parameters, Smith Chart and applications.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

UNIT II RF FILTER DESIGN 9

Overview, Basic resonator and filter configuration, Special filter realizations, Filter implementations, Coupled filter.

UNIT III ACTIVE RF COMPONENTS & APPLICATIONS 9

RF diodes, BJT, RF FETs, High electron mobility transistors; Matching and Biasing Networks – Impedance matching using discrete components, Microstripline matching networks, Amplifier classes of operation and biasing networks.

UNIT IV RF AMPLIFIER DESIGNS 9

Characteristics, Amplifier power relations, Stability considerations, Constant gain circles, Constant VSWR circles, Low Noise circuits, Broadband , high power and multistage amplifiers.

UNIT V OSCILLATORS, MIXERS & APPLICATIONS 9

Basic Oscillator model, High frequency oscillator configuration, Basic characteristics of Mixers ; Phase Locked Loops ; RF directional couplers and hybrid couplers ; Detector and demodulator circuits.

TOTAL HOURS : 45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Analyze the scattering parameters through the smith chart.
CO2: Design the filter realizations and implementations with knowledge of basic characteristics.
CO3: Analyze the parameters of matching networks using the discrete components.
CO4: Explain the basic definition and to choose the appropriate method for high frequency applications.
CO5: Learn the characteristics of oscillators, mixers and couplers

REFERENCE BOOKS

1. Reinhold Ludwig and Powel Bretchko, RF Circuit Design – Theory and Applications, Pearson Education Asia, First Edition, 2001.
2. Joseph . J. Carr, Secrets of RF Circuit Design , McGraw Hill Publishers, Third Edition, 2000.
3. Mathew M. Radmanesh, Radio Frequency & Microwave Electronics, Pearson Education Asia, Second Edition, 2002
4. Ulrich L. Rohde and David P. NewKirk, RF / Microwave Circuit Design, John Wiley & Sons USA 2000
5. Roland E. Best, Phase - Locked Loops : Design, simulation and applications, McGraw Hill Publishers 5TH edition 2003

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Analyze the scattering parameters through the smith chart.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co2	Design the filter realizations and implementations with knowledge of basic characteristics.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co3	Analyze the parameters of matching networks using the discrete components	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co4	Explain the basic definition and to choose the appropriate method for high frequency applications	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co5	Learn the characteristics of oscillators, mixers and couplers	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

218COE02 **ADVANCED MICROWAVE SYSTEMS** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Learn about the field analysis of the planar transmission lines.
- Understand the circuit theory for waveguide systems.
- Learn the filter design and periodic structures.
- Measure and analyse the parameters of the microwave amplifiers.
- Acquire knowledge in the propagation and transformation of the Gaussian beams.

UNIT I FIELD ANALYSIS OF PLANAR TRANSMISSION LINES 9

Microstrip Transmission Lines – Attenuation – High frequency properties of Microstrip lines. Coupled Microstrip lines – even and odd modes. Strip transmission lines – Coupled strip lines – Fin lines.

UNIT II CIRCUIT THEORY FOR WAVE GUIDE SYSTEMS 9

Equivalent voltages and currents – Impedance description of waveguide elements and circuits – one port circuit. Foster's reactance theorem. N-port circuits. Two port junctions. Excitation of waveguides. Probe coupling in rectangular waveguide. Radiation from linear current elements and current loops.Waveguide coupling by apertures.

UNIT III PERIODIC STRUCTURES AND FILTERS 9

Wave analysis of periodic structures. Periodic structures composed of Unsymmetrical two port networks. Terminated Periodic structures.Matching of Periodic structures.Floquet's theorem and spatial Harmonics. Microwave Filters – Image parameter method. Filter design by insertion loss method. Low pass filter design. Microstrip parallel coupled filter.

UNIT IV MICROWAVE SOLID STATE AMPLIFIERS 9

S-parameters - Unilateral design of amplifiers – simultaneous conjugate match. Bilateral design of amplifiers.Amplifierstability.Conditional and unconditional stability criteria.Amplifier power gain.Constant gain circles.Noise temperature concept. Noise factor and noise figure. Noise temperature for cascaded stages.Constant noise figure circles. Design of single stage microwave amplifiers.

UNIT V MICROWAVES AND OPTICS 9

Geometrical optics as a limiting case of wave optics. Ray matrices for paraxial ray optics. Gaussian beams. Generation of Gaussian beams at microwave frequencies. The beam waist. Propagation of Gaussian beams in Homogeneous medium. Transformation of Gaussian beams with lenses.

TOTAL HOURS : 45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Understand the different modes of the planar transmission lines.
CO2: Determine of the impedance and radiation pattern for the waveguide systems.
CO3: Acquire knowledge in image parameter method and spatial harmonics.
CO4: Analyze in the conditional and unconditional stability criteria for the solid state amplifiers.
CO5: Analyse the geometric optics, gaussian beams and its transformation with lenses.

REFERENCE BOOKS

1. R.E.Collin, " Foundations for Microwave Engineering", McGraw-Hill, 1992.
2. Ramo, Whinnery and Van Duzer : "Fields and Waves in communication electronics".3rdEdition., Wiley, 1997

3. David M Pozar," Microwave Engineering", John Wiley & Sons Inc, 2004

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Understand the different modes of the planar transmission lines.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co2	Determine of the impedance and radiation pattern for the waveguide systems	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co3	Acquire knowledge in image parameter method and spatial harmonics.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co4	Analyze in the conditional and unconditional stability criteria for the solid state amplifiers	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co5	Analyse the geometric optics, gaussian beams and its transformation with lenses.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**

218COE03 COMMUNICATION PROTOCOL ENGINEERING L T P C

3 0 0 3

COURSE OBJECTIVES

- Learn the architecture, protocol and services of the Network reference model.
- Understand the SDL based protocol and other protocol specification languages.
- Learn the protocol verification and validation approach for SDL.
- Understand the performance of the conformance protocol

UNIT I NETWORK REFERENCE MODEL 9

Communication model-software, subsystems, protocol, protocol development methods, Protocol engineering process, Layered architecture, Network services and Interfaces, Protocol functions, OSI model ,TCP/IP protocol suite

UNIT II PROTOCOL SPECIFICATIONS 9

Components of protocol, Specifications of Communication service, Protocol entity, Interface, Interactions, Multimedia protocol, Internet protocol, SDL, SDL based protocol- other protocol specification languages

UNIT III PROTOCOL VERIFICATION/VALIDATION 9

Protocol verification, Verification of a protocol using finite state machines, Protocol validation, protocol design errors, Protocol validation approaches, SDL based protocol verification and validation

UNIT IV PROTOCOL CONFORMANCE/PERFORMANCE TESTING 9

Conformance testing methodology and frame work, Conformance test architectures, Test sequence generation methods, Distributed architecture by local methods, Conformance testing with TTCN, systems with semi controllable interfaces - RIP,SDL based tools for conformance testing, SDL based conformance testing of MPLS Performance testing, SDL based performance testing of TCP and OSPF, Interoperability testing, SDL based interoperability testing of CSMA/CD and CSMA/CA protocol using Bridge, Scalability testing

UNIT V PROTOCOL SYNTHESIS AND IMPLEMENTATION 9

Protocol synthesis, Interactive synthesis algorithm, Automatic synthesis algorithm, Automatic synthesis of SDL from MSC, Protocol Re-synthesis; Requirements of protocol implementation, Object based approach to protocol implementation, Protocol compilers, Tool for protocol engineering

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

TOTAL HOURS : 45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Acquire knowledge in the OSI model and TCP/IP protocol suite.
CO2: Implement the SDL based protocol for interface and other entity.
CO3: Acquire knowledge in the protocol verification approach for SDL.
CO4: Acquire knowledge in analysis of the conformance protocol
CO5:Acquire knowledge in Protocol synthesis.

REFERENCE BOOKS

1. PallapaVenkataram and SunilkumarS.Manvi, "Communication protocol Engineering", Eastern Economy edition, 2004
2. Richard Lai and Jirachiefpattana, "Communication Protocol Specification and Verification", Kluwer Publishers, Boston, 1998.
3. Tarnay, K., "Protocol Specification and Testing", Plenum, New York, 1991.
4. Mohamed G. Gouda, "Elements of Network Protocol Design", John Wiley & Sons, Inc. New York, USA, 1998
5. V.Ahuja, "Design and Analysis of Computer Communication networks", McGraw-Hill, London, 1982
6. G.J.Holtzmann, "Design and validation of Computer protocols", Prentice Hall, New York, 1991.

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O 1	PS O 2	PS O 3
Co1	Acquire knowledge in the OSI model and TCP/IP protocol suite.	**3**	**2**	**3**	**1**	**3**	1			**1**		**1**	**3**	**1**	
Co2	Implement the SDL based protocol for interface and other entity.	**3**	**2**	**3**	**1**	**3**	1			**1**		**1**	**3**	**1**	
Co3	Acquire knowledge in the protocol verification approach for SDL	**3**	**2**	**3**	**1**	**3**	1			**1**		**1**	**3**	**1**	
Co4	Acquire knowledge in analysis of the conformance protocol	**3**	**2**	**3**	**1**	**3**	1			**1**		**1**	**3**	**1**	
Co5	Acquire knowledge in Protocol synthesis.	**3**	**2**	**3**	**1**	**3**	1			**1**		**1**	**3**	**1**	

218COE04 GLOBAL POSITIONING SYSTEMS L T P C

3 0 0 3

COURSE OBJECTIVES

- Learn the overview of GPS.
- Acquire knowledge on the coordinates and satellite orbits.
- Study the mathematical modes for positioning the satellite.
- Learn the tropospheric and ionospheric effects by the GPS observables

UNIT I OVERVIEW OF GPS 9

History of GPS – BC–4 System – HIRAN – NNSS – NAVSTAR GLONASS and GNSS Systems – GPS Constellation – Space Segment – Control Segment – User Segment– Single and Dual Frequency – Point – Relative – Differential GPS – Static and Kinematic Positioning – 2D and 3D – Reporting Anti Spoofing (AS)– Selective Availability (SA) – DOP Factors .

UNIT II REFERENCE SYSTEMS & SATELLITE ORBITS 9

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

Coordinate Systems – Geo Centric Coordinate System – Conventional Terrestrial Reference System – Orbit Description – Keplerian Orbit – Kepler Elements – Satellite Visibility –Topocentric Motion – Disturbed Satellite Motion – Perturbed Motion – Disturbing Accelerations – Perturbed Orbit – Time Systems – Astronomical Time System – Atomic Time – GPS Time – Need for Coordination – Link to Earth Rotation – Time and Earth Motion Services .

UNIT III MATHEMATICAL MODELS FOR POSITIONING 9

Code, P–code, Y code, L1, L2 Carrier frequencies – Code Pseudo Ranges – Carries Phases –Pseudo Ranges – Satellite Signal Signature – Navigation Messages and Formats – Un differenced and Differenced Range Models – Delta Ranges – Signal Processing and Processing Techniques –Tracking Networks – Ephemerides – Data Combination – Narrow Lane– Wide Lane – OTF Ambiguity .

UNIT IV DATA PROCESSING & OBSERVABLES 9

Propagation Media – Multipath – Antenna Phase Centre – Atmosphere in brief – Elements of Wave Propagation – Ionospheric Effects on GPS Observations – Code Delay– Phase Advances – Integer Bias – Clock Error – Cycle Slip – Noise Bias – Blunders – Tropospheric Effects on GPS Oberservables – Multipath Effect – Antenna Phase Centre Problems and Correction .

UNIT V APPLICATIONS OF GPS 9

Disciplinary Applications – Crystal Dynamics – Gravity Field Mapping un –Atmospheric Occulation – Surveying – Geophysics – Air Borne GPS – Ground Transportation – Space Borne GPS – Metrological and Climate Research using GPS .

TOTAL HOURS : 45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Acquire knowledge in GPS constellation and its operations.
CO2: Understand the various motion and their coordinate systems.
CO3: Implement the signal processing techniques and tracking networks.
CO4: Apply the various parameters to processes data and observables
CO5: Develop applications using GPS.

REFERENCE BOOKS

1. B Hoffman, Wellenhof H, Lichtenegger and J Collins, “GPS Theory and Practice”, 4th revised edition, Springer, Wein, New york 1997
2. B Parkinson J SpilkerJr (Eds), “GPS Theory and Applications”, Vol I &Vol II AIAA 370 L'Enfant Promenade, SW Washington, DC 20024, 1996
3. A Leick, “GPS Satellites Surveying”, 2nd edition, John Wiley & Sons, NewYork, 1995
4. A Kleusberg and P Teunisen(Eds), “GPS for Geodesy”, Springer Verlag Berlin 1996
5. L Adams, “The GPS A Shared National Asset”, Chair National Academy Press, Washington, DC 1995.

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Acquire knowledge in GPS constellation and its operations..	3	2	3	1	3				1		3	3	1	
Co2	Understand the various motion and their coordinate systems.	3	2	3	1	3				1		3	3	1	
Co3	Implement the signal processing techniques and tracking networks.	3	2	3	1	3				1		3	3	1	
Co4	Apply the various parameters to processes data and observables	3	2	3	1	3				1		3	3	1	
Co5	Develop applications using GPS.	3	2	3	1	3				1		3	3	1	

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

218COE05 ANALYSIS AND DESIGN OF PLANAR TRANSMISSION LINES L T P C

3 0 0 3

COURSE OBJECTIVES

- Study the different technologies of microwave integrated circuits
- Analyze the planar transmission line.
- Learn about the hybrid mode analysis.
- Know about the Strip line design formulation.

UNIT I ANALYSIS OF PLANAR TRANSMISSION LINES 9

Planar Transmission Lines: Strip line - micro strip line - coplanar waveguide - coplanar strips slot line - fin line and characteristics - properties - design parameters and its applications; Technology of MICs: Monolithic and hybrid substrates - thin and thick film technologies -advantages and applications

UNIT II SPECTRAL DOMAIN METHODS 9

Spectral domain methods. Formulation of quasi-static and dynamic spectral domain analyses. Galekin's method

UNIT III ANALYSIS OF HYBRID MODE 9

Hybrid mode analysis. Formulation. Application in planar transmission lines. Characteristic equation. Evaluation of parameters.

UNIT IV DESIGN OF COPLANAR & SLOT LINES 9

Coplanar lines, quasi-static and full wave analysis. Design equations. Comparison with microstrip and slot lines.

UNIT V MICROSTRIP LINES 9

General analysis of coupled lines. Design considerations for microstrip lines and coplanar Waveguides.

TOTAL HOURS : 45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Acquire knowledge about analysis of planar transmission lines.
CO2: Design of strip lines and co-planar lines.
CO3: Acquire knowledge in analysis of hybrid mode
CO4: Learn about the design consideration of microstrip lines
CO5: Learn about the design consideration of coplanar waveguides

TEXT BOOKS

1. .Itoh, Numerical Techniques for Microwave and Millimeter Wave Passive Structures, John Wiley & Sons, 1989
2. C.Nguyen, Analysis Methods for RF, Microwave and Planar Transmission Line
3. Structures, Wiley, 2000

REFERENCE BOOKS

1. C. Nquyen, Analysis Methods for RF, Microwave, and Millimeter-Wave Planar
2. Transmission Line Structures, Wiley Interscience, 2000
3. Joseph J. Carr, "RF Components and Circuits", Newnes, 2002
4. Leo G. Maloratsky, "Passive RF & Microwave Integrated Circuits", Elsevier, 2004.

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Acquire knowledge about analysis of planar transmission lines.	3	2	3	1	3	1			1		3	1		1
Co2	Design of strip lines and co-planar lines.	3	2	3	1	3	1			1		3	1		1
Co3	Acquire knowledge in analysis of hybrid mode	3	2	3	1	3	1			1		3	1		1
Co4	Learn about the design consideration of microstrip lines	3	2	3	1	3	1			1		3	1		1
Co5	Learn about the design consideration of coplanar waveguides	3	2	3	1	3	1			1		3	1		1

218COE06 **MIXED - SIGNAL CIRCUIT DESIGN** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Know mixed signal circuits like DAC, ADC, PLL etc.
- Gain knowledge on filter design in mixed signal mode.
- Acquire knowledge on design different architectures in mixed signal mode

UNIT I PHASE LOCKED LOOP 9

Characterization of a comparator, basic CMOS comparator design, analog multiplier design, PLL - simple PLL, charge-pump PLL, applications of PLL.

UNIT II SAMPLING CIRCUITS 9

Basic sampling circuits for analog signal sampling, performance metrics of sampling circuits, different types of sampling switches. Sample-and-Hold Architectures- Open-loop & closed-loop architectures, open-loop architecture with miller capacitance, multiplexed-input architectures, recycling architecture, switched capacitor architecture, current-mode architecture.

UNIT III D/A CONVERTER ARCHITECTURES 9

Input/output characteristics of an ideal D/A converter, , performance metrics of D/A converter, D/A converter in terms of voltage, current, and charge division or multiplication, , switching functions to generate an analog output corresponding to a digital input. Resistor-Ladder architectures, Current steering architectures

UNIT IV A/D CONVERTER ARCHITECTURES 9

Input/output characteristics and quantization error of an A/D converter, performance metrics of pipelined architectures, Successive approximation architectures, interleaved architectures.

UNIT V INTEGRATOR BASED FILTERS 9

Low Pass filters, active RC integrators, MOSFET-C integrators, transconductance-c integrator, discrete time integrators. Filtering topologies - bilinear transfer function and biquadratic transferfunction.

TOTAL HOURS : 45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1: Acquire knowledge in mixed signal circuits like DAC, ADC, PLL etc.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

CO2: Acquire knowledge in filter design in mixed signal mode.
CO3: Design different architectures in mixed signal mode of DAC
CO4: Design different architectures in mixed signal mode of ADC
CO5: Understand about Integrated based filters

REFERENCE BOOKS

1. Razavi, "Design of analog CMOS integrated circuits", McGraw Hill, Edition 2002
2. Razavi, "Principles of data conversion system design", Wiley IEEE Press, 1st Edition, 1994
3. Jacob Baker, "CMOS Mixed-Signal circuit design", IEEE Press, 2009
4. Gregorian, Temes, "Analog MOS Integrated Circuit for signal processing", John Wiley & Sons, 1986
5. Baker, Li, Boyce, "CMOS: Circuit Design, layout and Simulation", PHI, 2000

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Acquire knowledge in mixed signal circuits like DAC, ADC, PLL etc.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**	**1**	
Co2	Acquire knowledge in filter design in mixed signal mode.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**	**1**	
Co3	Design different architectures in mixed signal mode of DAC.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**	**1**	
Co4	Design different architectures in mixed signal mode of ADC.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**	**1**	
Co5	Understand about Integrated based filters	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**	**1**	

218COE07 **NETWORK ROUTING ALGORITHMS** **L T P C**
3 0 0 3

COURSE OBJECTIVES

- Learn the various routing techniques in the circuit switching and packet switching networks.
- Learn the algorithm for the ATM,PNNI and planet network.
- Acquire knowledge in the mobility management, routing algorithm for various packet radio networks.
- Learn different routing algorithms for the MANET.

UNIT I CIRCUIT SWITCHING NETWORKS **9**

AT & T's Dynamic Routing Network, Routing in Telephone Network-Dynamic Non Hierarchical Routing-Trunk Status Map Routing-Real Time Network Routing, Dynamic Alternative Routing-Distributed Adaptive Dynamic Routing-Optimized Dynamic Routing.

UNIT II PACKET SWITCHING NETWORKS **9**

Distance vector Routing, Link State Routing, Inter domain Routing-Classless Interdomain routing (CIDR), Interior Gateway routing protocols (IGRP) - Routing Information Protocol (RIP), Open Shortest Path First (OSPF), Exterior Gateway Routing Protocol (EGRP) - Border Gateway Protocol (BGP), Apple Talk Routing and SNA Routing.

UNIT III HIGH SPEED NETWORKS **9**

Routing in optical networks-The optical layer, Node Designs, Network design and operation, Optical layer cost tradeoffs, Routing and wavelength assignment, Architectural variations, Routing in ATM networks-ATM address structure, ATM Routing, PNNI protocol, PNNI signaling protocol, Routing in the PLANET network and Deflection Routing.

UNIT IV MOBILE NETWORKS 9

Routing in Cellular Mobile Radio Communication networks-Mobile Network Architecture, Mobility management in cellular systems, Connectionless Data service for cellular systems, Mobility and Routing in Cellular Digital Packet Data (CDPD) network, Packet Radio Routing-DARPA packet radio network, Routing algorithms for small, medium and large sized packet radio networks.

UNIT V MOBILE AD-HOC NETWORKS (MANET) 9

Internet based mobile ad-hoc networking, communication strategies, routing algorithms – Table-driven routing - Destination Sequenced Distance Vector (DSDV), Source initiated on-demand routing-Dynamic Source Routing (DSR), Ad-hoc On- demand Distance Vector (AODV), Hierarchical based routing- Cluster head Gateway Switch Routing (CGSR) and Temporally-Ordered Routing Algorithm (TORA), Quality of Service.

TOTAL HOURS : 45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1:Analyze the data transmission with the various routing algorithm in circuit and packet switching networks.
CO2: Gain knowledge in packet switching networks with its algorithms
CO3: Design the secured data transmission based on the optical and ATM networks.
CO4: Design, operate and debug mobile network architecture.
CO5: Acquire knowledge in the different routing algorithms for the MANET

REFERENCE BOOKS

1. M. Steen strub, “Routing in Communication networks”, Prentice Hall International, NewYork, 1995
2. “Internetworking Technologies Handbook”, Fourth Edition, Inc. Cisco Systems, ILSG Cisco Systems, 2003
3. William Stallings, “ISDN and Broadband ISDN with Frame Relay and ATM”, PHI, New Delhi, 2004.
4. Behrouz A Forouzan, “Data Communications and Networking (3/e), TMH, 2004
5. William Stallings, “High Speed Networks TCP/IP and ATM Design Principles”, Prentice Hall International, New York, 1998.
6. Mohammad Ilyas, “The Handbook of Ad hoc Wireless Networks” CRC Press, 2002.
7. Vijay K.Garg, “Wireless Network Evolution: 2G to 3G”, Pearson Education, New Delhi, India, 2003
8. Rajiv Ramaswami and Kumar N.Sivarajan, “Optical Networks”,Morgan Kaufmann Publishers,1998
9. SumitKasera and Pankajsethi, ”ATM Networks”, Tata McGraw-Hill Publishing Company limited, New Delhi,2001
10. IEEE Journal on Selected Areas in Communications, Special issue on Wireless Ad-hoc Networks, Vol. 17, No.8, 1999

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Analyze the data transmission with the various routing algorithm in circuit and packet switching networks.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**	**1**	
Co2	Gain knowledge in packet switching networks with its algorithms	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**	**1**	
Co3	Design the secured data transmission based on the optical and ATM networks.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**	**1**	
Co4	Design, operate and debug mobile network architecture	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**	**1**	
Co5	Acquire knowledge in the different routing algorithms for the MANET	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**	**1**	

218COE08 **DIGITAL COMMUNICATION RECEIVERS** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Learn the basic concepts and techniques of the digital communication.
- Learn the correlation and demodulation of optimum receivers for AWGN channel.
- Analyze the detection of the receiver for fading channels.
- Learn the various synchronization technique for digital communication

UNIT I REVIEW OF DIGITAL COMMUNICATION TECHNIQUES 9

Base band and band pass communication, signal space representation, linear and non- linear modulation techniques, and spectral characteristics of digital modulation.

UNIT II OPTIMUM RECEIVERS FOR AWGN CHANNEL 9

Correlation demodulator, matched filter, maximum likelihood sequence detector, Optimum receiver for CPM signals, M-ary orthogonal signals, envelope detectors for M-ary and correlated binary signals.

UNIT III RECEIVERS FOR FADING CHANNELS 9

Characterization of fading multiple channels, statistical models, slow fading, frequency selective fading, diversity technique, RAKE demodulator, coded waveform for fading channel

UNIT IV SYNCHRONIZATION TECHNIQUES 9

Carrier and symbol synchronization, carrier phase estimation – PLL, Decision directed loops, symbol timing estimation, maximum likelihood and non-decision directed timing estimation, joint estimation.

UNIT V ADAPTIVE EQUALIZATION 9

Zero forcing algorithm, LMS algorithm, Adaptive decision – feedback equalizer, and equalization of Trellis-coded signals, Kalman algorithm, blind equalizers, and stochastic gradient algorithm, Echo cancellation.

TOTAL HOURS : 45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1:Learn the fundamentals of the digital communication techniques.
CO2:Design the optimum receivers for AWGN channel.
CO3:Applythe diversity technique for fading channels.
CO4:Implement the carrier estimation and symbol synchronization.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

CO5: Learn different algorithms for adaptive equalization.

REFERENCE BOOKS

1. Heinrich Meyer, Mare Moeneclacy and Stefan.A. Fechtel, "Digital Communication Receivers", Vol I & II, John Wiley, New York, 1997
2. John. G. Proakis, "Digital Communication", 4th ed., McGraw Hill, New York, 2001
3. E.A. Lee and D.G. Messerschmitt, "Digital Communication", 2nd edition, Allied Publishers, New Delhi, 1994
4. Simon Marvin, "Digital Communication Over Fading channel; An unified approach to performance Analysis", John Wiley, New York, 2000
5. S.Rajasekaran and G.A.VijayalakshmiPai "Neural networks,Fuzzylogics,and Genetic algorithms
6. Bernard Sklar, "Digital Communication Fundamentals and Applications, Prentice Hall, 1998.

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Learn the fundamentals of the digital communication techniquese	3	2	3	1	3				1		3	1	1	
Co2	Design the optimum receivers for AWGN channel	3	2	3	1	3				1		3	1	1	
Co3	Apply the diversity technique for fading channels	3	2	3	1	3				1		3	1	1	
Co4	Implement the carrier estimation and symbol synchronization	3	2	3	1	3				1		3	1	1	
Co5	Learn different algorithms for adaptive equalization.	3	2	3	1	3				1		3	1	1	

218COE09 ADVANCED MICROPROCESSORS & MICROCONTROLLERS L T P C
3 0 0 3

COURSE OBJECTIVES

- Acquire knowledge on the basic concept of the microprocessor architecture.
- Learn the addressing modes, instruction set and programming in the Pentium processor.
- Study the architecture, assembly language program and instruction set of the ARM.
- Learn the operating modes and various attributes of the Motorola 68HC11 microcontroller.

UNIT I MICROPROCESSOR ARCHITECTURE 9

Instruction set – Data formats – Instruction formats – Addressing modes – Memory hierarchy – register file – Cache – Virtual memory and paging – Segmentation – Pipelining – The instruction pipeline – pipeline hazards – Instruction level parallelism – reduced instruction set – Computer principles – RISC versus CISC – RISC properties – RISC evaluation – On-chip register files versus cache evaluation .

UNIT II HIGH PERFORMANCE CISC ARCHITECTURE: PENTIUM 9

The software model – functional description – CPU pin descriptions – RISC concepts – bus operations – Super scalar architecture – pipe lining – Branch prediction – The instruction and caches – Floating point unit –protected mode operation – Segmentation – paging – Protection – multitasking – Exception and interrupts – Input /Output – Virtual 8086 model – Interrupt processing -Instruction types – Addressing modes – Processor flags – Instruction set -programming the Pentium processor.

UNIT III HIGH PERFORMANCE RISC ARCHITECTURE: ARM 9

The ARM architecture – ARM assembly language program – ARM organization and implementation – The ARM instruction set - The thumb instruction set – ARM CPU cores.

UNIT IV MOTOROLA 68HC11 MICROCONTROLLERS 9

Instructions and addressing modes – operating modes – Hardware reset – Interrupt system – Parallel I/O ports – Flags – Real time clock – Programmable timer – pulse accumulator – serial communication interface – A/D converter – hardware expansion – Assembly language Programming

UNIT V PIC MICRO CONTROLLER 9

CPU architecture – Instruction set - Interrupts – Timers – I/O port expansion –I2C bus for peripheral chip access – A/D converter – UART

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

CO1: Understand the piplining, segmentation, instruction level parallelism and RISC and CISC evaluation.
CO2: Design the high performance Pentium processor.
CO3: Apply the ARM processor for the global demands.
CO4: Interface the programmable timer, pulse accumulator and serial communication.
CO5: Understand the architecture of PIC micro controller

REFERENCE BOOKS

1. Daniel Tabak , '' Advanced Microprocessors" McGraw Hill.Inc., 1995
2. James L. Antonakos, "The Pentium Microprocessor '' Pearson Education, 1997.
3. Steve Furber, '' ARM System –On –Chip architecture "Addison Wesley, 2000.
4. Gene .H.Miller." Micro Computer Engineering," Pearson Education, 2003.
5. John .B.Peatman, "Design with PIC Microcontroller, Prentice hall, 1997.
6. James L.Antonakos," An Introduction to the Intel family of Microprocessor s '' Pearson Education 1999.
7. Barry.B.Breg," The Intel Microprocessors Architecture , Programming and
8. Interfacing ", PHI, 2002
9. Valvano "Embedded Microcomputer Systems" Thomson Asia PVT LTD first reprint 2001

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Understand the piplining, segmentation, instruction level parallelism and RISC and CISC evaluation	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**3**	**1**	
Co2	Design the high performance Pentium processor	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**3**	**1**	
Co3	Apply the ARM processor for the global demands	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**3**	**1**	
Co4	Interface the programmable timer, pulse accumulator and serial communication.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**3**	**1**	
Co5	Understand the architecture of PIC micro controller	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**3**	**1**	

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

218COE10 **DIGITAL IMAGE PROCESSING** **L T P C**
3 0 0 3

COURSE OBJECTIVES

- Learn the fundamentals of the visual perception and digital image processing elements.
- Learn and analyse different types of image transform.
- Learn the various techniques for image restoration and enhancement.
- Study the morphological operators and image segmentation.

UNIT I DIGITAL IMAGE FUNDAMENTALS 9

Elements of digital image processing systems, Elements of visual perception, psycho visual model, brightness, contrast, hue, saturation, mach band effect, Color image fundamentals -RGB,HSI models, Image acquisition and sampling, Quantization, Image file formats, Two-dimensional convolution, correlation, and frequency responses.

UNIT II IMAGE TRANSFORMS 9

1D DFT, 2D transforms – DFT, DCT, Discrete Sine, Walsh, Hadamard, Slant, Haar, KLT, SVD, Radon, and Wavelet Transform.

UNIT III IMAGE ENHANCEMENT AND RESTORATION 9

Histogram modification and specification techniques, Noise distributions, Spatial averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Contra harmonic filters, Homomorphic filtering, Color image enhancement. Image Restoration – degradation model, Unconstrained and Constrained restoration, Inverse filtering, Wiener filtering, Geometric transformations – spatial transformations, Gray-Level interpolation.

UNIT IV IMAGE SEGMENTATION AND RECOGNITION 9

Edge detection. Image segmentation by region growing, region splitting and merging, edge linking, Morphological operators: dilation, erosion, opening, and closing. Image Recognition – Patterns and pattern classes, matching by minimum distance classifier, Statistical Classifier. Matching by correlation, Neural network application for image recognition.

UNIT V IMAGE COMPRESSION 9

Need for image compression, Huffman, Run Length Encoding, Arithmetic coding, Vector Quantization, Block Truncation Coding. Transform Coding – DCT and Wavelet. Image compression standards.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

CO1: Apply the image acquisition, sampling and quantization.
CO2: Design and analyze the various transform of images.
CO3: Implement the image segmentation and restoration for the different images.
CO4: Design the neural network to recognize images.
CO5: Understand about Image Compression

REFERENCE BOOKS

1. Rafael C. Gonzalez, Richard E.Woods, 'Digital Image Processing', Pearson Education, Inc., Second Edition, 2004.
2. Anil K. Jain, 'Fundamentals of Digital Image Processing', Prentice Hall of India, 2002.
3. David Salomon : Data Compression – The Complete Reference, Springer Verlag New York Inc., 2nd Edition, 2001

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

4. Rafael C. Gonzalez, Richard E.Woods, Steven Eddins, ' Digital Image Processing using MATLAB', Pearson Education, Inc., 2004
5. William K.Pratt, ' Digital Image Processing', John Wiley, NewYork, 2002
6. MilmanSonka, Vaclav Hlavac, Roger Boyle, 'Image Processing, Analysis, and Machine Vision', Brooks/Cole, Vikas Publishing House, II ed., 1999.
7. Sid Ahmed, M.A., 'Image Processing Theory, Algorithms and Architectures', McGrawHill, 1995
8. Lim, J.S., 'Two Dimensional Signal and Image Processing', Prentice-Hall, New Jersey, 1990

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Apply the image acquisition, sampling and quantization.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**3**	**1**	
Co2	Design and analyze the various transform of images	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**3**	**1**	
Co3	Implement the image segmentation and restoration for the different images.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**3**	**1**	
Co4	Design the neural network to recognize images.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**3**	**1**	
Co5	Understand about Image Compression	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**3**	**1**	

218COE11 **SPECTRAL ANALYSIS OF SIGNALS** **L T P C**
3 0 0 3

COURSE OBJECTIVES

- Study about the technologies involved in PSD.
- Learn the types of estimation of PSD, non-parametric and parametric methods.
- Learn about filter bank methods.

UNIT I POWER SPECTRAL DENSITY 9

Power Spectral Density**:** Energy spectral density of deterministic signals- Power spectral density of random signals- Properties of PSD.

UNIT II NON-PARAMETRIC METHODS 9

PSD Estimation - Non-parametric methods : Estimation of PSD from finite data- Non-parametric methods : Periodogram properties, bias and variance analysis- Blackman-Tuckey method-Window design considerations- time-bandwidth product and resolution - variance trade-offs in window design, Refined periodogram methods : Bartlet method, Welch method.

UNIT III PARAMETRIC METHOD FOR RATIONAL SPECTRA 9

Parametric method for rational spectra :- Covariance structure of ARMA process-AR signals- Yule-Walker method- Least square method- Levinson-Durbin Algorithm-MA signals- Modified Yule-Walker method- Two stage least squaremethod- Burg method for AR parameter estimation.

UNIT IV PARAMETRIC METHOD FOR LINE SPECTRA 9

Parametric method for line spectra :- Models of sinusoidal signals in noise, Nonlinear least squares method, Higher order Yule-Walker method, MUSIC and Pisayenko methods, Min-norm method, ESPIRIT method.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

UNIT V FILTERBANK METHODS 9

Filterbank methods: Filterbank interpolation of periodogram, Slepia base-band filters, refined filterbank method for higher resolution spectral analysis, Capon method.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

CO1: Understand concept of Power and Energy spectral density of signals.
CO2: Implementation of the Parametric and non parametric methods of estimation of PSD.
CO3: Implementation of Parametric rational spectra
CO4: Implementation of Parametric line spectra
CO5: Design the Filter bank methods of spectral analysis.

REFERENCE BOOKS

1. Spectral Analysis of signals, P.Stroica&R.Moses, Pearson,2005
2. Fundamentals of Statistical Signal Processing, S.M.Key, Prentice Hall PTR, 1998
3. Introduction to Spectral Analysis, Marple, Prentice Hall, 2004
4. Modern Spectral Estimation Theory & Applications, Kay SM, Prentice Hall, 2000

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Understand concept of Power and Energy spectral density of signals.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**3**	**1**	
Co2	Implementation of the Parametric and non parametric methods of estimation of PSD	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**3**	**1**	
Co3	Implementation of Parametric rational spectra	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**3**	**1**	
Co4	Implementation of Parametric line spectra	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**3**	**1**	
Co5	Design the Filter bank methods of spectral analysis.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**3**	**1**	

218COE12 DETECTION AND ESTIMATION L T P C

3 0 0 3

COURSE OBJECTIVES

- Know if a minimum variance unbiased estimator (MVUE) exists & computation
- Determine if an efficient estimator exists and computation
- Compute the Cramer-Rao lower bound for scalar, vector cases and MVUE for linear models
- Compute maximum likelihood estimator, linear least-squares estimator, and maximum aposteriori estimator etc..,
- Apply theory and estimation algorithms learned in class to real-world examples

UNIT I HYPOTHESIS TESTING 9

Bayes Risk, Minimum Bayes Risk detector, Minimax and Neyman-Pearson testing, Receiver operating characteristics, Composite hypothesis testing, Generalized likelihood ratio tests.

UNIT II SIGNAL DETECTION APPLICATIONS 9

Detection of deterministic signals, Matched filter and its performance, Detection of random signals, Energy detector and its performance, Detection of signals with unknown parameters and Sinusoid detection example, Chernoff and related performance bounds

UNIT III RANDOM PARAMETER ESTIMATION 9

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

Bayesian formulation, Minimum mean squared error and MAP estimation, Linear MMSE estimation, Orthogonality principle, Applications to channel estimation problems

UNIT IV MINIMUM VARIANCE UNBIASED ESTIMATION 9

MVUE criterion, finding MVUE, sufficient statistics, Neyman-fisher factorization, Rao-Blackwell theorem, Cramer-Rao lower bound, Fisher information matrix

UNIT V NON-RANDOM PARAMETER ESTIMATION 9

Least squares estimation, Best linear unbiased estimation, Geometric interpretations, Maximum likelihood Estimation, Efficiency and consistency of estimators and asymptotic properties

TOTAL HOURS : 45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Acquire knowledge in minimum variance unbiased estimator (MVUE) exists & computation

CO2: Determine if an efficient estimator exists and computation

CO3: Compute the Cramer-Rao lower bound for scalar, vector cases and MVUE for linear models

CO4: Compute maximum likelihood estimator, linear least-squares estimator, and maximum aposteriori estimator etc..,

CO5: Apply theory and estimation algorithms learned in class to real-world examples

TOTAL HOURS : 45 PERIODS

TEXT BOOKS

1. **H. L. Van Trees, "Detection, Estimation, and Modulation Theory, Part I," John Wiley, 1968**

REFERENCE BOOKS

1. S. M. Kay, "Fundamentals of Statistical Signal Processing: Detection Theory," Prentice Hall, 1998.
2. H. V. Poor, "An Introduction to Signal Detection and Estimation," Springer, Second Edition, 1998
3. S. M. Kay, "Fundamentals of Statistical Signal Processing: Estimation Theory," Prentice Hall, 1993
4. Gregorian, Temes, “Analog MOS Integrated Circuit for signal processing”, John Wiley & Sons, 1986
5. Baker, Li, Boyce, “CMOS: Circuit Design, layout and Simulation”, PHI, 2000

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Acquire knowledge in minimum variance unbiased estimator (MVUE) exists & computation	**3**	**2**	**3**	**1**	**3**	1				**1**	**3**	**1**		**1**
Co2	Determine if an efficient estimator exists and computation	**3**	**2**	**3**	**1**	**3**	1				**1**	**3**	**1**		**1**
Co3	Compute the Cramer-Rao lower bound for scalar, vector cases and MVUE for linear models	**3**	**2**	**3**	**1**	**3**	1				**1**	**3**	**1**		**1**
Co4	Compute maximum likelihood estimator, linear least-squares estimator, and maximum aposteriori estimator etc..,	**3**	**2**	**3**	**1**	**3**	1				**1**	**3**	**1**		**1**

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

Co5	Apply theory and estimation algorithms learned in class to real-world examples	**3**	**2**	**3**	**1**	**3**	**1**				**1**	**3**	**1**		**1**

218COE13 **INTERNETWORKING MULTIMEDIA** **L T P C**
3 0 0 3

COURSE OBJECTIVES

- Learn the characteristics of the multimedia Networking.
- Study the resource reservation, broadband, storage and media services.
- Acquire on transport protocol such as TCP, RTP, RTCP, MIME and other computing.
- Learn the various functionalities and standards of the MPEG.

UNIT I MULTIMEDIA NETWORKING 9

Digital sound, video and graphics, basic multimedia networking, multimedia characteristics, evolution of Internet services model, network requirements for audio/ video transform, multimedia coding and compression for text, image, audio and video.

UNIT II BROADBAND NETWORK TECHNOLOGY 9

Broadband services, ATM and IP, IPV6, High speed switching, resource reservation, Buffer management, traffic shaping, caching, scheduling, and policing, throughput, delay and jitter performance. Storage and media services, voi and video over IP, MPEG-2 over ATM/IP, indexing synchronization of requests, recording and remote control.

UNIT III RELIABLE TRANSPORT PROTOCOL AND APPLICATIONS 9

Multicast over shared media network, multicast routing and addressing, scaling multicast and NBMA networks, Reliable transport protocols, TCP adaptation algorithm, RTP, RTCP. MIME, Peer- to-Peer computing, shared application, video conferencing, centralized and distributed conference control, distributed virtual reality, light weight session philosophy.

UNIT IV MULTIMEDIA COMMUNICATION STANDARDS 9

Objective of MPEG- 7 standard, Functionalities and systems of MPEG-7, MPEG-21 Multimedia Framework Architecture, - Content representation, Content Management and usage, Intellectual property management, Audio visual system- H322: Guaranteed QOS LAN systems; MPEG_4 video Transport across internet.

UNIT V MULTIMEDIA COMMUNICATION ACROSS NETWORKS 9

Packet Audio/video in the network environment, video transport across Generic networks- Layered video coding, error Resilient video coding techniques, Scalable Rate control, Streaming video across Internet, Multimedia transport across ATM networks and IP network, Multimedia across wireless networks.

TOTAL HOURS : 45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Understand network requirement for the multimedia applications.

CO2: Analyze the various services related to the broadband network technology

CO3: Apply the adaptation algorithm in various applications such as video conferencing and distribution of virtual reality.

CO4: Demonstrate the content representation and management in multimedia protocol.

Co5: Understand the multimedia communication protocol across networks.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

REFERENCE BOOKS

1. Jon Crowcroft, Mark Handley, Ian Wakeman, Internetworking Multimedia, Harcourt Asia Pvt. Ltd. Singapore, 1998.
2. B.O. Szuprowicz, Multimedia Networking, McGraw Hill, Newyork. 1995.
3. Tay Vaughan, Multimedia - Making it to work, 4ed, Tata McGraw Hill ,NewDelhi, 2000
4. K.R.Rao, Zoran S. Bojkovic and Dragorad A. Milovanovic, Multimedia Communication systems, PHI , 2003

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Understand network requirement for the multimedia applications.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co2	Analyze the various services related to the broadband network technology	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co3	Apply the adaptation algorithm in various applications such as video conferencing and distribution of virtual reality.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co4	Demonstrate the content representation and management in multimedia protocol	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co5	Understand the multimedia communication protocol across networks.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**

218COE14 DSP PROCESSOR ARCHITECTURE AND PROGRAMMING L T P C

3 0 0 3

COURSE OBJECTIVES

- Learn the architecture, pipelining and addressing modes of P-DSP's.
- Learn the architecture, addressing modes, instruction sets, operation and application of the TMS320C3X, ADSP, TMS320C54X,and TMS320C6X

UNIT I FUNDAMENTALS OF PROGRAMMABLE DSPS 9

Multiplier and Multiplier accumulator (MAC) – Modified Bus Structures and Memory access in Programmable DSPs – Multiple access memory – Multi-port memory – VLIW architecture- Pipelining – Special Addressing modes in P-DSPs – On chip Peripherals.

UNIT II TMS320C3X PROCESSOR 9

Architecture – Data formats - Addressing modes – Groups of addressing modes- Instruction sets - Operation – Block Diagram of DSP starter kit – Application Programs for processing real time signals – Generating and finding the sum of series, Convolution of two sequences, Filter design.

UNIT III ADSP PROCESSORS 9

Architecture of ADSP-21XX and ADSP-210XX series of DSP processors- Addressing modes and assembly language instructions – Application programs –Filter design, FFT calculation.

UNIT IV ADVANCED PROCESSORS I 9

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

Architecture of TMS320C54X: Pipe line operation, Addressing modes and assembly language instructions Introduction to Code Composer studio

UNIT V ADVANCED PROCESSORS II 9

Architecture of TMS320C6X - Architecture of Motorola DSP563XX – Comparison of the features of DSP family processors.

TOTAL HOURS : 45 PERIODS

COURSE OUTCOMES

CO1: Acquire knowledge in the fundamentals of the P-DSP'S.
CO2: Implement the different processor for domestic and industrial applications
CO3: Knowledge in ADSP processors.
CO4: Acquire knowledge in the Architecture of TMS320C54X
CO5: Gain knowledge about DSP563XX processor

REFERENCE BOOKS

1. B.Venkataramani and M.Bhaskar, "Digital Signal Processors – Architecture, Programming and Applications" – Tata McGraw – Hill Publishing Company Limited. New Delhi, 2003
2. User guides Texas Instrumentation, Analog Devices, Motorola

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Acquire knowledge in the fundamentals of the P-DSP'S.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co2	Implement the different processor for domestic and industrial applications.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co3	Knowledge in ADSP processors.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co4	Acquire knowledge in the Architecture of TMS320C54X	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co5	Gain knowledge about DSP563XX processor	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**

218COE15 ERROR CONTROL CODING L T P C

3 0 0 3

COURSE OBJECTIVES

- Understand the concepts of linear block codes, cyclic and non-binary codes.
- Apply the various convolution decoding methods in the receiver system.
- Implement the modulation codes in the data transmission.
- Applythe various iterative decoding methods of the turbo codes

UNIT I REVIEW OF MODERN ALGEBRA 9

Galois fields. Linear block codes; encoding and decoding. Cyclic codes.Non-binary codes.

UNIT II CONVOLUTIONAL CODES 9

Generator sequences.Structural properties.ML decoding.Viterbidecoding.Sequential decoding.

UNIT III MODULATION CODES 9

Trellis coded modulation. Lattice type Trellis codes. Geometrically uniform trellis codes.Decoding of modulation codes.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

UNIT IV TURBO CODES 9

Turbo decoder.Interleaver.Turbodecoder.MAP and log MAP decoders.Iterative turbo decoding.Optimum decoding of turbo codes.

UNIT V SPACE-TIME CODES 9

MIMO systems.Space-time codes.MIMO systems. Space-time block codes (STBC) – decoding of STBC.

TOTAL HOURS : 45 PERIODS

COURSE OUTCOMES

CO1: Understand the concepts of linear block codes, cyclic and non-binary codes.
CO2: Apply the various convolution decoding methods in the receiver system.
CO3: Implement the modulation codes in the data transmission.
CO4: Apply the various iterative decoding methods of the turbo codes.
CO5: Understand about Space time codes

TEXT BOOKS

1. B .S.Lin&D.J.Costello, Error Control Coding (2/e), Pearson, 2005.
2. B.Vucentic&J.Yuan, Turbo codes, Kluwer, 2000

REFERENCE BOOKS

1. C.B.Schlegel&L.C.Perez, Trellis and Turbo Coding Wiley,2004
2. B.Vucetic&J.yuan, Space-Time Coding, Wiley, 2003
3. R.Johannaesson&K.S.Zigangirov, Fundamentals of Convolutional Coding, Universities Press, 2001

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Understand the concepts of linear block codes, cyclic and non-binary codes.	**3**	**2**	**3**	**1**	**3**				**1**		**3**	**1**		**1**
Co2	Apply the various convolution decoding methods in the receiver system.	**3**	**2**	**3**	**1**	**3**				**1**		**3**	**1**		**1**
Co3	Implement the modulation codes in the data transmission.	**3**	**2**	**3**	**1**	**3**				**1**		**3**	**1**		**1**
Co4	Apply the various iterative decoding methods of the turbo codes.	**3**	**2**	**3**	**1**	**3**				**1**		**3**	**1**		**1**
Co5	Understand about Space time codes	**3**	**2**	**3**	**1**	**3**				**1**		**3**	**1**		**1**

218COE16 SMART ANTENNAS L T P C

3 0 0 3

Course Objectives

- Learn the fundamentals of the smart antennas.
- Study the application of the smart antennas for CDMA.
- Acquire knowledge in the various channel models.
- Study the optimal spatial filtering and adaptive algorithms for CDMA

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

UNIT I INTRODUCTION TO SMART ANTENNAS 9

Spatial processing for wireless systems. Adaptive antennas. Beam forming networks. Digital radio receiver techniques and software radios.

UNIT II SMART ANTENNAS TECHNIQUES FOR CDMA 9

Coherent and non-coherent CDMA spatial processors. Dynamic re-sectoring. Range andcapacity extension – multi-cell systems.

UNIT III CHANNEL MODELS 9

Spatial – temporal channel models. Environment and signal parameters.Geometrically based single bounce elliptical model.

UNIT IV CAPACITY IMPROVEMENT OF CDMA 9

Optimal spatial filtering – adaptive algorithms for CDMA.Multitarget decision – directed algorithm.

UNIT V ESTIMATION TECHNIQUES 9

Estimation – conventional and subspace methods. ML estimation techniques. Estimation of the number of sources using Eigen decomposition. Direction finding and true ranging PL systems. Elliptic and hyperbolic PL systems.TDOA estimation techniques.

TOTAL HOURS : 45 PERIODS

COURSE OUTCOMES

CO1: Acquire knowledge in the Digital radio receiver techniques and spatial processing for wireless systems.
CO2: Implement the applications related to the CDMA technique.
CO3: Measure the signal parameters for the geometrically based single bounce elliptical model.
CO4: Design the smart antenna application with optimal spatial filtering and adaptive algorithms for CDMA.
CO5: Understand the estimation techniques

REFERENCE BOOKS

1. T.S.Rappaport&J.C.Liberti, Smart Antennas for Wireless Communication, Prentice
2. Hall (PTR) , 1999.
3. M.J. Bronzel, Smart Antennas, John Wiley, 2004
4. R.Janaswamy, Radio Wave Propagation and Smart Antennas for WirelessCommunication, Kluwer, 2001

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Acquire knowledge in the Digital radio receiver techniques and spatial processing for wireless systems.	**3**	**2**	**3**	**1**	**3**				**1**		**3**	**1**		**1**
Co2	Implement the applications related to the CDMA technique.	**3**	**2**	**3**	**1**	**3**				**1**		**3**	**1**		**1**
Co3	Measure the signal parameters for the geometrically based single bounce elliptical model.	**3**	**2**	**3**	**1**	**3**				**1**		**3**	**1**		**1**

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

Co4	Design the smart antenna application with optimal spatial filtering and adaptive algorithms for CDMA.	**3**	**2**	**3**	**1**	**3**				**1**		**3**	**1**		**1**
Co5	Understand the estimation techniques	**3**	**2**	**3**	**1**	**3**				**1**		**3**	**1**		**1**

218COE17 **COGNITIVE RADIO** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Study the different techniques and computational methods for Cognitive Radio.
- Know the main rules underlying in Cognitive techniques.
- Address the difficulties related to the present day techniques.
- Adopt Cognitive techniques in solving problems in the real world

UNIT I INTRODUCTION TO SOFTWARE DEFINED RADIO 9

Definitions and potential benefits, software radio architecture evolution, technology tradeoffs and architecture implications.

UNIT II SDR ARCHITECTURE 9

Essential functions of the software radio, basic SDR, hardware architecture, Computational processing resources, software architecture, top level component interfaces, interface topologies among plug and play modules.

UNIT III INTRODUCTION TO COGNITIVE RADIOS 9

Marking radio self-aware, cognitive techniques – position awareness, environment awareness in cognitive radios, optimization of radio resources, Artificial Intelligence Techniques.

UNIT IV COGNITIVE RADIO ARCHITECTURE 9

Cognitive Radio – functions, components and design rules, Cognition cycle – orient, plan, decide and act phases, Inference Hierarchy, Architecture maps, Building the Cognitive Radio Architecture on Software defined Radio Architechture

UNIT V NEXT GENERATION WIRELESS NETWORKS 9

The XG Network architecture, spectrum sensing, spectrum management, spectrum mobility, spectrum sharing, upper layer issues, cross – layer design

TOTAL HOURS : 45 PERIODS

COURSE OUTCOMES

CO1: Describe the basics of the software defined radios.
CO2: Design the wireless networks based on the cognitive radios.
CO3: Understand the Architecture of cognitive radio
CO4: Explain the concepts behind the wireless networks
CO5: Explain the concepts behind the next generation networks

REFERENCE BOOKS

1. Joseph Mitola III,"Software Radio Architecture: Object-Oriented Approaches to Wireless System Engineering", John Wiley & Sons Ltd. 2000

2. Thomas W.Rondeau, Charles W. Bostain, “Artificial Intelligence in Wireless communication”, ARTECH
3. Bruce A. Fette, “Cognitive Radio Technology”, Elsevier, 2009
4. Ian F. Akyildiz, Won – Yeol Lee, Mehmet C. Vuran, Shantidev Mohanty, “Next generation / dynamic spectrum access / cognitive radio wireless networks: A Survey” Elsevier Computer Networks, May 2006
5. Simon Haykin, “Cognitive Radio: Brain –Empowered Wireless Communications”, IEEE Journal on selected areas in communications, Feb 2005
6. Hasari Celebi, Huseyin Arslan, “Enabling Location and Environment Awareness in Cognitive Radios”, Elsevier Computer Communications , Jan 2008
7. Markus Dillinger, Kambiz Madani, Nancy Alonistioti, “Software Defined Radio”, John Wiley, 2003.
8. Huseyin Arslan, “Cognitive Radio, SDR and Adaptive System”, Springer, 2007

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Describe the basics of the software defined radios.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co2	Design the wireless networks based on the cognitive radios.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co3	Understand the Architecture of cognitive radio	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co4	Explain the concepts behind the wireless networks	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co5	Explain the concepts behind the next generation networks	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**

218COE18 ULTRA WIDEBAND COMMUNICATION SYSTEMS L T P C
3 0 0 3

COURSE OBJECTIVES

- Develop a comprehensive overview of UWB system design that spans propagation
- Design transmitter and receiver antenna implementations.
- Adopt Signal processing techniques in solving problems in the real world

UNIT I UWB SIGNALS AND SYSTEMS WITH UWB WAVEFORMS 9

Introduction – Power spectral density – Pulse shape – Pulse trains – Spectral masks – Multipath – Penetration characteristics – Spatial and spectral capacities – Speed of data transmission – Gaussian waveforms – Designing waveforms for specific spectral masks – Practical constraints and effects of imperfections.

UNIT II SIGNAL PROCESSING TECHNIQUES FOR UWB SYSTEMS AND UWB CHANNEL MODELING 9

Effects of a lossy medium on a UWB transmitted signal – Time domain analysis – Frequency domain techniques – A simplified UWB multipath channel model – Path loss model – Two-ray UWB propagation model – Frequency domain autoregressive model.

UNIT III UWB COMMUNICATIONS AND ADVANCED UWB PULSE GENERATION 9

UWB modulation methods – Pulse trains – UWB transmitter/receiver – Multiple access techniques in UWB – Capacity of UWB systems – Comparison of UWB with other wideband communication systems – Interference and coexistence of UWB with other systems – Hermite pulses – Orthogonal prolate spheroidal wave functions – Wavelet packets in UWB PSM – Applications of UWB communication systems.

UNIT IV UWB ANTENNAS & ARRAYS, POSITION & LOCATION WITH UWB SIGNALS 9

Antenna fundamentals – Antenna radiation for UWB signals – Conventional antennas and Impulse antennas for UWB systems – Beamforming for UWB signals – Radar UWB array systems – Wireless positioning and location – GPS techniques – Positioning techniques – Time resolution issues – UWB positioning and communications.

UNIT V UWB COMMUNICATION STANDARDS AND ADVANCED TOPICS IN UWB COMMUNICATION SYSTEMS 9

SYSTEMS UWB standardization in wireless personal area networks – DS-UWB proposal – MB-OFDM UWB proposal – IEEE proposals for UWB channel models – UWB ad-hoc and sensor networks – MIMO and Space-time coding for UWB systems – Self interference in high data-rate UWB communications – Coexistence of DS-UWB with WIMAX

TOTAL HOURS : 45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to:

CO1: Understand the basic signal processing techniques that concerns present and future dynamic UWB communication systems.

CO2: Understand the all areas of design and implementation of UWB systems

CO3: Understand the advanced UWB pulse generation

CO4: Understand the concepts of UWB antennas and arrays

CO5: Gain knowledge in UWB communication standards

TEXT BOOKS

1. M. Ghavami, L. B. Michael and R. Kohno, "Ultra Wideband signals and systems in Communication Engineering", 2nd Edition, John Wiley & Sons, NY, USA, 2007.

REFERENCE BOOKS

1. Jeffrey H. Reed, "An Introduction to Ultra Wideband Communication systems", Prentice Hall Inc., NJ, USA, 2005
2. HomayounNikookar and Ramjee Prasad, "Introduction to Ultra Wideband for Wireless Communications"1st Edition, Springer Science & Business Media B.V. 2009
3. Thomas Kaiser, FengZheng "Ultra Wideband Systems with MIMO", 1st Edition, John Wiley & Sons Ltd, Newyork, 2010.
4. W. Pam Siriwongpairat and K. J. Ray Liu, "Ultra-Wideband Communications Systems: Multiband OFDM approach" John Wiley and IEEE press, Newyork 2008

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Understand the basic signal processing techniques that concerns present and	3	2	3	1	3	1			1		3	1		1

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

	future dynamic UWB communication systems.														
Co2	Understand the all areas of design and implementation of UWB systems	**3**	**2**	**3**	**1**	**3**	**1**			**1**		**3**	**1**		**1**
Co3	Understand the advanced UWB pulse generation	**3**	**2**	**3**	**1**	**3**	**1**			**1**		**3**	**1**		**1**
Co4	Understand the concepts of UWB antennas and arrays	**3**	**2**	**3**	**1**	**3**	**1**			**1**		**3**	**1**		**1**
Co5	Gain knowledge in UWB communication standards	**3**	**2**	**3**	**1**	**3**	**1**			**1**		**3**	**1**		**1**

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

318COE01 **EMBEDDED SYSTEMS FOR COMMUNICATION** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Understand about Embedded Architecture and to design of hardware and software components
- Study about the embedded processor and computing platform
- Learn the Embedded Networks
- Acquire the Embedded Real time characteristic and System design technique

UNIT I EMBEDDED ARCHITECTURE **9**

Embedded Computers, Characteristics of Embedded Computing Applications, Challenges in Embedded System Design, Embedded System Design Process - Requirements, Specification, Architectural Design, Designing Hardware and Software Components, System Integration.

UNIT II EMBEDDED PROCESSOR AND COMPUTING PLATFORM **9**

ARM processor- processor and memory organization, data operations, flow of control, SHARC processor- memory organization, data operations, flow of control, parallelism with instructions, CPU Bus configuration, ARM Bus, SHARC Bus, Memory Devices, Input / Output Devices. Design Example: Alarm Clock.

UNIT III NETWORKS **9**

Distributed Embedded Architecture - Hardware and Software Architectures, Networks for embedded systems- I2C, CAN Bus, SHARC link ports, Ethernet, Myrinet, Internet. Design Example: Elevator Controller.

UNIT IV REAL-TIME CHARACTERISTICS **9**

Clock driven Approach, weighted round robin Approach, Priority driven Approach, Dynamic Versus Static systems, effective release times and deadlines, Optimality of the Earliest deadline first (EDF) algorithm, Off-line Versus On-line scheduling.

UNIT V SYSTEM DESIGN TECHNIQUES **9**

Design Methodologies, Requirement Analysis, Specification, System Analysis and Architecture Design, Quality Assurance, Design Example: Telephone PBX-Ink jet printer- Personal Digital Assistants, Set-top Boxes.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Design hardware and software components
CO2: Knowledge in Embedded processor and computing platform
CO3: Knowledge in Embedded Networks
CO4: Design the Real time Characteristic and System design for Embedded Systems
CO5: understand the system design techniques

REFERENCE BOOKS

1. Wayne Wolf, Computers as Components: Principles of Embedded Computing System Design, Morgan Kaufman Publishers, 2001.
2. Jane.W.S. Liu Real-Time systems, Pearson Education Asia, 2000
3. C. M. Krishna and K. G. Shin , Real-Time Systems, ,McGraw-Hill, 1997

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

4. Frank Vahid and Tony Givargi, Embedded System Design: A Unified Hardware/Software Introduction, s, John Wiley & Sons, 2000

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Design hardware and software components	3	2	1	1		1			1		3	3	2	
Co2	Knowledge in Embedded processor and computing platform	3	2	1	1		1			1		3	3	2	
Co3	Knowledge in Embedded Networks	3	2	1	1		1			1		3	3	2	
Co4	Design the Real time Characteristic and System design for Embedded Systems	3	2	1	1		1			1		3	3	2	
Co5	understand the system design techniques	3	2	1	1		1			1		3	3	2	

318COE02 SPEECH AND AUDIO SIGNAL PROCESSING L T P C

3 0 0 3

COURSE OBJECTIVES

- Learn the concept of Speech and Audio
- Implement the time and Frequency domain methods for speech processing
- Develop about Homomorphic Speech Analysis
- Acquire about Linear Predictive Analysis of Speech

UNIT I MECHANICS OF SPEECH 9

Speech production: Mechanism of speech production, Acoustic phonetics - Digital models for speech signals - Representations of speech waveform: Sampling speech signals, basics of quantization, delta modulation, and Differential PCM - Auditory perception: psycho acoustics.

UNIT II TIME DOMAIN METHODS FOR SPEECH PROCESSING 9

Time domain parameters of Speech signal – Methods for extracting the parameters Energy, Average Magnitude – Zero crossing Rate – Silence Discrimination using ZCR and energy – Short Time Auto Correlation Function – Pitch period estimation using Auto Correlation Function

UNIT III FREQUENCY DOMAIN METHOD FOR SPEECH PROCESSING 9

Short Time Fourier analysis – Filter bank analysis – Formant extraction – Pitch Extraction – Analysis by Synthesis- Analysis synthesis systems- Phase vocoder—Channel Vocoder.
Cepstral analysis of Speech – Formant and Pitch Estimation – HomomorphicVocoders.

UNIT IV LINEAR PREDICTIVE ANALYSIS OF SPEECH 9

Formulation of Linear Prediction problem in Time Domain – Basic Principle – Auto correlation method – Covariance method – Solution of LPC equations – Cholesky method – Durbin's Recursive algorithm – lattice formation and solutions – Comparison of different methods – Application of LPC parameters – Pitch detection using LPC parameters – Formant analysis – VELP – CELP.

UNIT V APPLICATION OF SPEECH & AUDIO SIGNAL PROCESSING 9

Algorithms: Spectral Estimation, dynamic time warping, Hidden Markov model – Music analysis – Pitch Detection – Feature analysis for recognition – Music synthesis – Automatic Speech Recognition – Feature Extraction for ASR – Deterministic sequence recognition – Statistical Sequence recognition – ASR systems – Speaker identification and verification – Voice response system – Speech Synthesis: Text to speech,voice over IP.

TOTAL HOURS:45 PERIODS

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Demonstrate the concept of Speech and Audio
CO2: Knowledge of Speech Processing in time and Frequency domains
CO3: Demonstrate the Homomorphic Speech analysis
CO4: Analyze Speech in Linear Predictive Method
CO5: Gain knowledge in speech recognition and detection algorithms

REFERENCE BOOKS

1. Ben Gold and Nelson Morgan, Speech and Audio Signal Processing, John Wiley and Sons Inc. , Singapore, 2004.
2. L.R.Rabiner and R.W.Schaffer – Digital Processing of Speech signals – Prentice Hall -1978.
3. Quatieri – Discrete-time Speech Signal Processing – Prentice Hall – 2001.
4. L.R. Rabiner and B. H. Juang, "Fundamentals of speech recognition", Prentice Hall, 1993

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Demonstrate the concept of Speech and Audio	**3**	**2**	**1**	1		1			**1**		**3**	**3**	**1**	
Co2	Knowledge of Speech Processing in time and Frequency domains	**3**	**2**	**1**	1		1			**1**		**3**	**3**	**1**	
Co3	Demonstrate the Homomorphic Speech analysis	**3**	**2**	**1**	1		1			**1**		**3**	**3**	**1**	
Co4	Analyze Speech in Linear Predictive Method	**3**	**2**	**1**	1		1			**1**		**3**	**3**	**1**	
Co5	Gain knowledge in speech recognition and detection algorithms	**3**	**2**	**1**	1		1			**1**		**3**	**3**	**1**	

318COE03 COMMUNICATION NETWORK SECURITY L T P C

3 0 0 3

COURSE OBJECTIVES

- Understand about Symmetric CIPHERS
- Learn Advanced Encryption Standard (AES) for Network security
- Understand the Network Security Practice
- Study about system security

UNIT I SYMMETRIC CIPHERS 9

Introduction – Services, Mechanisms and Attacks, OSI security Architecture, Model for network Security; Classical Encryption Techniques- Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Product ciphers , Data Encryption Standard- Block Cipher Principles, Strength of DES, Differential and Linear Crypt Analysis, Block Cipher Design Principles, BlockCipher Modes of Operation,Stegnography

UNIT II ADVANCED ENCRYPTION STANDARD AND STREAM CIPHERS 9

Evaluation Criteria for AES, AES Cipher; Contemporary Symmetric Ciphers- Triple DES, Blowfish, RC5- Characteristics of Advanced Symmetric Block Ciphers, Stream ciphers based on LFSRs,RC4 Stream Cipher; Random Number Generation. Traffic Confidentiality, Key Distribution.

UNIT III PUBLIC-KEY ENCRYPTION AND HASH FUNCTIONS 9

Public Key Cryptography and Key Management- RSA Algorithm and other public key cryptosystems-, Diffie-Hellman Key Exchange, Elliptic Curve arithmetic, Elliptic Curve Cryptography; Message Authentication and Hash Functions- Authentication Requirements, - MD5 Message Digest Algorithm; Secure Hash Algorithm, RIPEMD 160, HMAC; Digital Signatures and Authentication Protocols- Digital Signature Standards.

UNIT IV NETWORK SECURITY PRACTICE 9

Authentication Applications- Kerberos, X.509 Authentication Service; Electronic Mail Security- Pretty Good Privacy, S/MIME; IP Security- overview and Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations; Web Security- Web Security Considerations, Secure Sockets Layer and Transport Layer Security, Secure Electronic Transaction.

UNIT V SYSTEM SECURITY 9

Intruders- Intruder Detection, Password Management; Malicious Software- Virus and Related Threats, Virus Counter Measures; Firewalls- Firewall Design Principles, Trusted Systems.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Familiar with Symmetric CIPHERS
CO2: Knowledge in ADVANCED ENCRYPTION STANDARD (AES) and implementing for Network security
CO3: Know more about encrypting techniques
CO4: Demonstrate Network security practice
CO5: Design work in system security

REFERENCE BOOKS

1. William Stallings, "Cryptography and Network Security", 3rdEdition. Prentice Hall of India, New Delhi ,2004
2. William Stallings, "Network Security Essentials", 2ndEdition. Prentice Hall of India, New Delhi, 2004
3. Charlie Kaufman , "Network Security: Private Communication in Public World", 2ndEdition. Prentice Hall of India, New Delhi ,2004

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Familiar with Symmetric CIPHERS	**3**	**2**	**1**	**1**		**1**			**1**		**3**	**3**	**1**	
Co2	Knowledge in ADVANCED ENCRYPTION STANDARD (AES) and implementing for Network security	**3**	**2**	**1**	**1**		**1**			**1**		**3**	**3**	**1**	
Co3	Know more about encrypting techniques	**3**	**2**	**1**	**1**		**1**			**1**		**3**	**3**	**1**	
Co4	Demonstrate Network security practice	**3**	**2**	**1**	**1**		**1**			**1**		**3**	**3**	**1**	
Co5	Design work in system security	**3**	**2**	**1**	**1**		**1**			**1**		**3**	**3**	**1**	

318COE04 HIGH SPEED SWITCHING ARCHITECTURE L T P C

3 0 0 3

COURSE OBJECTIVES

- Learn the switching concept of High Speed Networks
- Learn the concept of ISDN and B-ISDN with the functions, Layers and services

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

- Learn the ATM Architecture with different networks
- Analyze various Queuing in ATM and IP switching

UNIT I HIGH SPEED NETWORK 9

LAN and WAN network evolution through ISDN to BISDN - Transfer mode and control of BISDN - SDH multiplexing structure - ATM standard; ATM adaptation layers.

UNIT II LAN SWITCHING TECHNOLOGY 9

Switching concepts; Switch forwarding techniques; switch path control - LAN switching; cut through forwarding; store and forward - virtual LANs.

UNIT III ATM SWITCHING ARCHITECTURE 9

Switch models - Blocking networks – basic and enhanced banyan networks - sorting networks – merge sorting - rearrangeable networks - full and partial connection networks - nonblocking networks – recursive network – construction and comparison of non-blocking network.

UNIT IV QUEUES IN ATM SWITCHES 9

Internal queuing – Input, output and shared queuing - multiple queuing networks –combined input, output and shared queuing – performance analysis of queued switches.

UNIT V IP SWITCHING 9

Architectures of Internet Switches and Routers-IP Over ATM address and next hop resolution –IPv6 over ATM - Optical Packet switching - Switching fabric on a chip.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Familiar with switching of High Speed Networks
CO2: Knowledge in ISDN and B-ISDN functions, Layers and services
CO3: Understand ATM architecture with different networks
CO4: Knowledge in Queues.
CO5: Learn concepts of IP switching.

REFERENCE BOOKS

1. Rich Siefert, Jim Edwards, “The All New Switch Book – The Complete Guide to LAN Switching Technology”, Wiley Publishing, Inc., Second Edition, 2008
2. Elhanany M. Hamdi, “High Performance Packet Switching architectures”, Springer Publications, 2007
3. Christopher Y Metz, Switching protocols & Architectures. McGraw Hill, New York.1998.
4. AchillePatavina, Switching Theory: Architectures and performance in Broadband ATM Networks. John Wiley & Sons Ltd., New York.1998
5. Ranier Handel, Manfred N Huber, Stefan Schrodder. ATM Networks-concepts, protocols, applications, 3rd Edition, Adisson Wesley, New York,1999.
6. JohnA.Chiong: Internetworking ATM for the internet and enterprise networks. McGraw Hill, New York, 1998.

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Familiar with switching of High Speed Networks	**3**	**2**	**1**	1		1			**1**		**3**	**1**		**1**

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

Co2	Knowledge in ISDN and B-ISDN functions, Layers and services	**3**	**2**	**1**	1		1			**1**		**3**	**1**		**1**
Co3	Understand ATM architecture with different networks	**3**	**2**	**1**	1		1			**1**		**3**	**1**		**1**
Co4	Knowledge in Queues	**3**	**2**	**1**	1		1			**1**		**3**	**1**		**1**
Co5	Learn concepts of IP switching	**3**	**2**	**1**	1		1			**1**		**3**	**1**		**1**

318COE05 **OFDM FOR COMMUNICATION SYSTEMS** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Understand the basics of OFDM and Synchronization error
- Study the signal processing and channel estimation aspects of OFDM
- Understand the interleaving and coding techniques in OFDM
- Understand the peak power problem and the methods of reducing it.

UNIT I INTRODUCTION TO OFDM **9**

Histroy of OFDM, orthogonal signals and vectors, quadrature modulation and demodulation, AWGN channel, detection of signals in noise, SNR, linear modulation schemes-ASK, QAM, PSK and DPSK. Channel model for OFDM systems-Introduction- characterization of mobile radio channel- Frequency Division (FD) channel modeling- FD channel simulation- application to millimeter-wave radio channels.

UNIT II SYSTEM MODELING CONCEPT OF MULTICARRIER TRANSMISSION **9**

OFDM as multicarrier transmission, Implementation of OFDM by FFT, OFDM with guard interval. OFDM introduction and block diagram, design of OFDM signal, OFDM system model, synchronization errors, performance of uncoded OFDM system-mathematical modeling, analytical evaluation of the BER and performance results.

UNIT III SYNCHRONIZATION **9**

Synchronization and signal processing aspects of OFDM-spectral shaping, sensitivity of OFDM signal against nonlinearities. Synchronization and channel estimation aspects - time and frequency synchronization, OFDM with pilot symbols for channel estimation- Wiener estimator and Wiener filtering for OFDM.

UNIT IV PAPR AND HYBRID CONCEPTS **9**

Distribution of PAP ratio, clipping and peak windowing, peak cancellation, PAP reduction codes-generating complementary codes, minimum distance of complementary codes, Maximum-Likelihood decoding of complementary codes, suboptimal decoding of complementary codes, large code lengths-symbol scrambling. Hybrid OFDM concept- structure of various multiple access schemes, comparison to MC-CDMA – analytical performance of fading channels- with perfect estimation and realistic estimation.

UNIT V APPLICATION OF OFDM **9**

OFDM Parameters – Channelisation – OFDM Signal Processing – Training – Digital Audio Broadcasting – Front End Impairments in the OFDM Modem – System Simulation Tools – Analysis and Simulation of the Main Front End Effects – Terrestrial Digital Video Broadcasting. Wireless LAN Standards: IEEE 802.11 - Hyper LAN and MMAC –Difference Between IEEE 802.11, Hyper LAN/2 and MMAC.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

Upon Completion of this course, students will be able to :

CO1: Understanding of application of OFDM for communication systems.
CO2: Knowledge of various techniques and aspects of OFDM.
CO3: Discussion about design and simulation of modulation and coding techniques using software
CO4: Learn the problems in OFDM and Hybrid OFDM.
CO5: Implement the applications of OFDM

REFERENCE BOOKS

1. Ramjee Prasad, OFDM for Wireless Communication Systems, Artech House,Inc, 2004.
2. RichardvanNee, Ramjee Prasad ,OFDM for wireless multimedia communications, Artech House, 2000
3. Henrik Schulze and Christian Luders, Theory and Applications of OFDM and CDMA-Wideband Wireless Communications, John Wiley & Sons Ltd, 2005.
4. Mare Engels, Wireless OFDM Systems ,KlumerAcademinc Publishers, 2002

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Understanding of application of OFDM for communication systems	**3**	**2**	**1**	1		1			**1**		**3**	**3**		**1**
Co2	Knowledge of various techniques and aspects of OFDM	**3**	**2**	**1**	1		1			**1**		**3**	**3**		**1**
Co3	Discussion about design and simulation of modulation and coding techniques using software	**3**	**2**	**1**	1		1			**1**		**3**	**3**		**1**
Co4	Learn the problems in OFDM and Hybrid OFDM.	**3**	**2**	**1**	1		1			**1**		**3**	**3**		**1**
Co5	Implement the applications of OFDM	**3**	**2**	**1**	1		1			**1**		**3**	**3**		**1**

318C0E06 BEAMFORMING IN WIRELESS COMMUNICATION L T P C
3 0 0 3

COURSE OBJECTIVES:

- Understand the basics of Beamforming.
- Understand the concepts of adaptive Beamforming and Subband adaptive Beamforming..
- Introduce to the students the design techniques of beamformers.
- Learn the effects of error in DBF.

UNIT I INTRODUCTION TO BEAMFORMING 9

Array signal processing- narrowband Beamforming-wideband Beamforming- wideband beamsteering-multiple access- digital Beamforming- fundamentals of digital Beamforming- introduction to antenna arrays, analog Beamforming, phased arrays, element-space Beamforming, beam-space Beamforming, two dimensional Beamforming.

UNIT II ADAPTIVE BEAMFORMING 9

Basic concepts- criteria for optimal weights- adaptive algorithms- LMS algorithm, direct sample covariance matrix inversion, RLS algorithm, neural networks. Partial adaptivity- Reference signal based beamformer- linearly constrained minimum variance Beamforming- constraints in LCMV

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

Beamforming- generalized side lobe cancellersoft constrained minimum variance beamformer- correlation constrained minimum variance beamformer- robust Beamforming.

UNIT III SUBBAND ADAPTIVE BEAMFORMING 9

Fundamentals of filter banks- Subband adaptive filtering- generalized Subband adaptive Beamforming- Generalized Subband Canceller (GSC)- Subband adaptive GSC- temporally/spatially Subband selective Beamformingfrequency domain adaptive Beamforming- transform domain adaptive Beamforming.

UNIT IV DIGITAL BEAMFORMING 9

Iterative optimization- least squares approach- Eigen filter approach- digital Beamforming networks- element-space and beam-space networks- DBF with multiple access schemes- DBF with TDMA, DBF with FDMA and DBF with CDMA.

UNIT V ERROR EFFECTS IN DBF 9

Error sources in DBF antenna arrays- random errors and nonlinearities in receivers- quantization errors in DBF arrays- complex signal quantization error and quantization noise in Beamforming- random errors in DBF arraysbeam pattern, fractional loss in main beam gain, pointing error, side lobes and effect of element failurenonlinearities in DBF arrays- modeling of nonlinearities, receiver nonlinearity effects on fixed Beamforming and receiver nonlinearity effects on adaptive Beamforming.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Understanding of application of Beamforming.
CO2: Knowledge of various Adaptive Beamforming techniques.
CO3: Knowledge of various Sub-band Beamforming techniques
CO4: Knowledge of various Digital Beamforming techniques.
CO5: Discussion about design and simulation of various beamformers using software.

REFERENCE BOOKS

1. Wei Liu and Stephen Weiss, Wideband Beamforming-concepts and techniques, John Wiley and Sons, 2010
2. John Litva and Titus Kwok-Yeung Lo, Digital Beamforming in Wireless Communication, Artech House, 1996.
3. By Yikun. Yu, Petrus Gerardus Maria Baltus, Arthur H. M. Van, Roermund Integrated 60GHz RF Beamforming in CMOS, springer 2011

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 1	PSO 3
Co1	Understanding of application of Beamforming.	**3**	**2**	**1**	1		1			**1**		**3**	3		
Co2	Knowledge of various Adaptive Beamforming techniques.									**1**					
Co3	Knowledge of various Sub-band Beamforming techniques									**1**					
Co4	Knowledge of various Digital Beamforming techniques.	**3**	**2**	**1**	1		1			**1**		**3**	3		
Co5	Discussion about design and simulation of various beamformers using software	**3**	**2**	**1**	1		1			**1**		**3**	3		

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

318COE07 SIMULATION OF COMMUNICATION SYSTEMS & NETWORKS L T P C
3 0 0 3

COURSE OBJECTIVES

- Design a reliable Communication Systems
- Simulate the random variables and random process for designing the channel
- Estimate the various performance measure in channel
- Understand the network queues

UNIT I MODELLING OF COMMUNICATION SYSTEM 9

Model of speech and picture signals, Pseudo noise sequences, Non-linear sequences, Analog channel model, Noise and fading, Digital channel model-Gilbert model of bursty channels, HF, Troposcatter and satellite channels, Switched telephone channels, Analog and Digital communication system models, Light wave system models.

UNIT II SIMULATION OF RANDOM VARIABLES AND RANDOM PROCESS 9

Univariate and multivariate models, Transformation of random variables, Bounds and approximation, Random process models-Markov and ARMA Sequences, Sampling rate for simulation, Computer generation and testing of random numbers

UNIT III ESTIMATION OF PERFORMANCE MEASURES 9

Quality of an estimator, estimator for SNR, Probability density functions of analog communication system, BER of digital communication systems, Monte Carlo method and Importance of sampling method, estimation of power spectral density

UNIT IV COMMUNICATION NETWORKS 9

Queuing models, M/M/I and M/M/I/N queues, Little formula, Burke's theorem ,M/G/I queue, Embedded Markov chain analysis of TDM systems, Polling, Random access systems

UNIT V NETWORK OF QUEUES 9

Queues in tandem, store and forward communication networks, capacity allocation, Congestion and flow chart, Routing model, Network layout and Reliability.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Design the reliable Communication systems
CO2: Simulating the random variable and random process for designing the channel
CO3: Estimate the various performance measure in channel
CO4: Understand about Queuing Models.
CO5: Knowledge in network Queues

REFERENCE BOOKS

1. M.C.Jeruchim,PhilipBalaban and K.SamShanmugan, "Simulation of communication systems", Springer, 2nd Edition, 2002.
2. A.M.Law and W.DavidKelton, "Simulation Modelling and analysis", 3rd Edition, McGraw Hill Inc., 1999
3. J.F.Hayes, “Modeling and Analysis of Computer Communication networks (Applications of Communication Theory)”, Plenum Press, 1984

4. Jerry Banks and John S.Carson and Barry L. Nelson, "Discrete-Event System Simulation", 4th Edition, Prentice Hall Inc., 2004

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Design the reliable Communication systems	3	2	1						1	1	3	1	1	
Co2	Simulating the random variable and random process for designing the channel	3	2	1						1	1	3	1	1	
Co3	Estimate the various performance measure in channel	3	2	1						1	1	3	1	1	
Co4	Understand about Queuing Models.	3	2	1						1	1	3	1	1	
Co5	Knowledge in network Queues	3	2	1						1	1	3	1	1	

318COE08 HIGH PERFORMANCE COMMUNICATION NETWORKS L T P C
3 0 0 3

COURSE OBJECTIVES

- Learn the concept of Switching Networks
- Learn the concept of Advanced Networking Concepts VPN,MPLS,RSVP
- Learn the ATM and FRAME relay with different Protocols
- Study about High Performance Communication WiMAX,LTE

UNIT I SWITCHING NETWORKS 9

Switching – Packet switching - Ethernet(IEEE 802.3), Token Ring(IEEE 802.5), FDDI, DQDB, Frame Relay, SMDS, Circuit Switched – SONET, DWDM, DSL, Intelligent Networks – CATV

UNIT II BROADBAND NETWORKS 9

Introduction: Multihop wireless broadband networks - mesh networks - MANET importance of routing protocols - classification of routing protocols in MANET - routing metrics – packet scheduling algorithms - admission control mechanism.

UNIT III ATM AND FRAME RELAY 9

ATM: Main features-addressing, signaling and routing, ATM header structure-adaptation layer, management and control, ATM switching and transmission.
Frame Relay: Protocols and services, Congestion control, Internetworking with ATM, Internet and ATM, Frame relay via ATM.

UNIT IV ADVANCED NETWORK 9

Vpn-Remote-Access Vpn, Site-To-Site Vpn ,Tunneling to PPP, Security in VPN. IP forwarding architectures overlay model, Multi Protocol Label Switching (MPLS), Tunneling and use of FEC, and MPLS based VPN, Traffic Engineering,Resource Reservation Protocol (RSVP).

UNIT V HIGH PERFORMANCE NETWORKS 9

Introduction: WiMAX overview - competing technologies - overview of the physical layer - PMP mode - mesh mode - multihop relay mode; Introduction: UWB overview - time hopping UWB -direct sequence UWB - multiband UWB; Introduction: LTE and LTE– A overview - system model - specifications - frame structure - comparison with broadband technologies.

TOTAL HOURS:45 PERIODS

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Familiar with Switching Networks
CO2: Knowledge in VPN,MPLS,RSVP Protocols
CO3: Understand ATM and FRAME relay protocols
CO4: Knowledge in Advanced Network Technology
CO5: Knowledge in High Performance Communication

REFERENCE BOOKS

1. Jean Warland and PravinVaraiya, "High Performance Communication Networks", 2nd Edition, Harcourt and Morgan Kanffman Publishers, London, 2008.
2. Leon Gracia, Widjaja, "Communication networks ", Tata McGraw-Hill, New Delhi, 2000.
3. Aunurag Kumar, D. Manjunath, Joy Kuri, "Communication Networking", Morgan KaufmannPublishers, 2011.
4. SumitKasera, PankajSethi, "ATM Networks ", Tata McGraw-Hill, New Delhi, 2000.
5. William Stallings,"High-speed Networks and Internets", 2nd edition, Pearson education Asia, 2003.
6. Rainer Handel, Manfred N.Huber and Stefan Schroder ,"ATM Networks",3rd edition, Pearson education asia,2002.
7. AmitabhaGhosh and RapeepatRatasuk, "Essentials of LTE and LTE-A", CambridgeUniversity, 2011.

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Familiar with Switching Networks	3	2	1						1		3	3		1
Co2	Knowledge in VPN,MPLS,RSVP Protocols	3	2	1						1		3	3		1
Co3	Understand ATM and FRAME relay protocols	3	2	1						1		3	3		1
Co4	Knowledge in Advanced Network Technology	3	2	1						1		3	3		1
Co5	Knowledge in High Performance Communication	3	2	1						1		3	3		1

318COE09 ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY IN SYSTEM DESIGN L T P C

3 0 0 3

COURSE OBJECTIVES

- Understand the EMI/EMC concept in Time and Frequency domain
- Understand the EMI Coupling Concept
- Learn the EMI standards and Measurements
- Learn the EMI control Techniques and to design a PCB for various application

UNIT I EMI ENVIRONMENT 9

EMI/EMC concepts and definitions, Sources of EMI, conducted and radiated EMI, Transient EMI, Time domain Vs Frequency domain EMI, Units of measurement parameters, Emission and immunity concepts, ESD.

UNIT II EMI COUPLING PRINCIPLES 9

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

Conducted, Radiated and Transient Coupling, Common Impedance Ground Coupling, Radiated Common Mode and Ground Loop Coupling, Radiated Differential Mode Coupling, Near Field Cable to Cable Coupling, Power Mains and Power Supply coupling.

UNIT III EMI/EMC STANDARDS AND MEASUREMENTS 9

Civilian standards - FCC,CISPR,IEC,EN, Military standards - MIL STD 461D/462, EMI Test Instruments /Systems, EMI Shielded Chamber, Open Area Test Site, TEM Cell, Sensors/Injectors/Couplers, Test beds for ESD and EFT, Military Test Method and Procedures (462).

UNIT IV EMI CONTROL TECHNIQUES 9

Shielding, Filtering, Grounding, Bonding, Isolation Transformer, Transient Suppressors, Cable Routing, Signal Control, Component Selection and Mounting.

UNIT V EMC DESIGN OF PCBs 9

PCB Traces Cross Talk, Impedance Control, Power Distribution Decoupling, Zoning, Motherboard Designs and Propagation Delay Performance Models.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Demonstrate the EMI/EMC concept in Time and Frequency domain
CO2: Demonstrate the EMI Coupling Concept
CO3: Knowledge in EMI standards and Measurements
CO4: Knowledge in EMI Control Techniques
CO5: Design the PCB for various applications

REFERENCE BOOKS

1. Henry W.Ott, "Noise Reduction Techniques in Electronic Systems", John Wiley and Sons, NewYork. 1988
2. C.R.Paul, “Introduction to Electromagnetic Compatibility” , John Wiley and Sons, Inc, 1992
3. V.P.Kodali, "Engineering EMC Principles, Measurements and Technologies", IEEE Press, 1996
4. Bernhard Keiser, "Principles of Electromagnetic Compatibility", Artech house, 3rd Ed, 1986

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Demonstrate the EMI/EMC concept in Time and Frequency domain	3	2	1						1		3	1		1
Co2	Demonstrate the EMI Coupling Concept	3	2	1						1		3	1		1
Co3	Knowledge in EMI standards and Measurements	3	2	1						1		3	1		1
Co4	Knowledge in EMI Control Techniques	3	2	1						1		3	1		1
Co5	Design the PCB for various applications	3	2	1						1		3	1		1

318COE10 RF MEMS L T P C

3 0 0 3

COURSE OBJECTIVES

- Learn the various types of analysis in RF MEMS switches.
- Study the DC switches and MEMS release procedure.
- Learn the MEMS SWITCH reliability, power handling and failure mechanisms.
- Study the MEMS phase shifters and various measurements.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

UNIT I SWITCHING 9

RF MEMS relays and switches: Switch parameters, Actuation mechanisms, Bistable relays and micro actuators, Dynamics of switching operation.

UNIT II COMPONENTS – I 9

MEMS inductors and capacitors: Micromachined inductor, Effect of inductor layout, Modeling and design issues of planar inductor, Gap tuning and area tuning capacitors, Dielectric tunable capacitors.

UNIT III COMPONENTS - II 9

MEMS phase shifters: Types. Limitations, Switched delay lines, Micromachined transmission lines, coplanar lines, Micromachined directional coupler and mixer.

UNIT IV FILTERS 9

Micromachined RF filters: Modeling of mechanical filters, Electrostatic comb drive, Micromechanical filters using comb drives, Electrostatic coupled beam structures.

UNIT V ANTENNAS 9

Micromachined antennas: Microstrip antennas – design parameters, Micromachining to improve performance, Reconfigurable antennas.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Understand the linear dynamic analysis and switching time calculations.
CO2: Demonstration of the various fabrication technique of the MEMS switch.
CO3: Implementation of the MEMS switches with fault handling mechanisms.
CO4: Designing the various phase shifters for DMTL and wide band distributed switches.
CO5: Insight in how critical modules in wireless systems can be designed and implemented using MEMS technology

REFERENCE BOOKS

1. V.K.Varadanetal, RFMEMS and their Applications, Wiley, 2003
2. H.J.DELOS SANTOS : RF MEMS circuit Design for Wireless Communications, Artech House, 2002.
3. G.M.REBEIZ, RF MEMS Theory, Design and Technology, John Wiley, 2003

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PSO 1	PSO 2	PSO 3
Co1	Understand the linear dynamic analysis and switching time calculations.	**3**	**2**	**1**	1		1					**3**	**1**		**1**
Co2	Demonstration of the various fabrication technique of the MEMS switch.	**3**	**2**	**1**	1		1					**3**	**1**		**1**
Co3	Implementation of the MEMS switches with fault handling mechanisms.	**3**	**2**	**1**	1		1					**3**	**1**		**1**
Co4	Designing the various phase shifters for DMTL and wide band distributed switches	**3**	**2**	**1**	1		1					**3**	**1**		**1**
Co5	Insight in how critical modules in wireless systems can be designed and implemented using MEMS technology	**3**	**2**	**1**	1		1					**3**	**1**		**1**

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

318COE11 **OPTICAL SIGNAL PROCESSING** **L T P C**
3 0 0 3

COURSE OBJECTIVES

- Learn the key aspects of OSP.
- Understand about the components spectrum analysis.
- Understand the features of spatial filtering and its applications
- Acquire knowledge heterodyne system.

UNIT I INTRODUCTION TO OSP **9**

Need for OSP, Fundamentals of OSP, The Fresnel Transform, Convolution and impulse response, Transform of a slit, Fourier Transforms in Optics, Transforms of aperture functions, Inverse Fourier Transform. Resolution criteria.

UNIT II OPTICAL SYSTEM **9**

A Basic Optical System, Imaging and Fourier Transform conditions. Cascaded systems, scale of Fourier Transform Condition. Maximum information capacity and optimum packing
Density .Chirp _ Z transform and system Coherence.

UNIT III SPECTRUM ANALYSIS **9**

Spectrum Analysis, Spatial light Modulators, special detector arrays. Performance parameters for spectrum analyzers. Relationship between SNR and Dynamic range. The 2D spectrum Analyzer.

UNIT IV SPATIAL FILTERING **9**

Spatial Filtering, Linear Space Invariant systems, Parseval's theorem , Correlation, Input/Output Spectral Densities, Matched filtering, Inverse Filtering. Spatial Filters. Interferometers. Spatial filtering systems. Spatial Modulators . Applications of Optical Spatial Filtering, Effects of small displacements.

UNIT V HETERODYNE SYSTEMS **9**

Heterodyne systems. Temporal and spatial interference. Optimum photo detector size, Optical radio. Direct detection and Hetero dyne detection. Heterodyne spectrum Analysis. Spatial and temporal Frequencies. The CW signal and a short pulse. Photo detector geometry and bandwidth. Power spectrum analyzer using a CCD array.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Gain Knowledge in OSP, Transforms, and its resolution criteria
CO2: Develop a OSP system.
CO3: Analyse performance parameters of spectrum analyzer
CO4: Implement the applications of optical spatial filtering
CO5:Model the heterodyne systems.

REFERENCE BOOKS

1. Anthony VanderLugt, Optical Signal Processing, John Wiley & Sons. 2005
2. D. Casasent, Optical data processing-Applications Springer
3. P.M. Dufffieux, The Fourier Transform and its applications to Optics, John Wiley and sons 1983
4. J.Horner, Optical Signal Processing AcademicPress1988

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Gain Knowledge in OSP, Transforms, and its resolution criteria	**3**	**2**	**1**	1		1			**1**		**3**	**1**		**1**
Co2	Develop a OSP system.	**3**	**2**	**1**	1		1			**1**		**3**	**1**		**1**
Co3	Analyse performance parameters of spectrum analyzer	**3**	**2**	**1**	1		1			**1**		**3**	**1**		**1**
Co4	Implement the applications of optical spatial filtering	**3**	**2**	**1**	1		1			**1**		**3**	**1**		**1**
Co5	Model the heterodyne systems	**3**	**2**	**1**	1		1			**1**		**3**	**1**		**1**

318COE12 ADVANCED MOBILE COMPUTING L T P C

3 0 0 3

COURSE OBJECTIVES

- Learn the key aspects of personal communication system.
- Understand about the components of wireless local area network
- Understand the features mobile internet protocol and wireless application protocol
- Study the wireless local loop techniques

UNIT I PERSONAL COMMUNICATION SYSTEMS 9

Introduction to Personal Communication Systems. PCS Architecture. Medium Access Techniques GSM Overview. Packet Switched Data. 2.5/3G Mobile Wireless Systems. GPRS, EDGE Systems.WCDMA& CDMA 2000 Systems.

UNIT II WIRELESS LOCAL AREA NETWORKS 9

Wireless Local Area Networks. IEEE 802.11, System Architecture and Protocol Architecture of IEEE 802.11. HIPERLAN Architecture, Bluetooth Networks.

UNIT III MOBILE INTERNET PROTOCOL 9

Introduction to Mobile Internet Protocol. IP Packet Delivery. Tunneling and Encapsulation. Reverse Tunneling.IPV4 and IPv6.

UNIT IV WIRELESS APPLICATION PROTOCOL 9

Wireless Application Protocol. Networks for WAP. WAP Layered Architecture and Protocol Stack.WAP Gateways. Wireless Markup Language(WML). Programming in WML. WML Script. Voice over Internet Protocol and Convergence Technologies.

UNIT V WIRELESS LOCAL LOOP TECHNIQUES 9

Wireless Local Loop Technologies. WLL Architecture Model. Mobile AD HOC Networks. AD HOC Routing Protocols. DSDV, DSR and AODV Routing Techniques. Quality of service in Mobile Ad hoc Networks.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Develop personal communication systems.
CO2: Model the mobile internet protocol.
CO3: Write the wireless mark-up language programming for wireless network
CO4: Implement WLL and Ad hoc networks.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

CO5: understand about wireless local loop techniques

REFERENCE BOOKS

1. Yi-Bing and Imrich Chlamtac, "Wirelwss and Mobile Networks Architectures", John Wiley &Sons,2001.
2. Raj Pandya, Mobile & Personal Communication Systems And Service, PHI
3. Asoke k Talukder , Roopa R Yavagal, Mobile Computing , Technology, Application and
4. Service Creation. Tata Mc Graw Hill
5. Jon W.Mark , Weihua Zhuang, " Wirelwss Communication and Networking", PHI
6. Jochen Schiller, Mobile Communication, Pearson Education

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Develop personal communication systems.	**3**	**2**	**1**	1		1			**1**		**3**	**3**		**1**
Co2	Model the mobile internet protocol	**3**	**2**	**1**	1		1			**1**		**3**	**3**		**1**
Co3	Write the wireless mark-up language programming for wireless network	**3**	**2**	**1**	1		1			**1**		**3**	**3**		**1**
Co4	Implement WLL and Ad hoc networks	**3**	**2**	**1**	1		1			**1**		**3**	**3**		**1**
Co5	understand about wireless local loop techniques	**3**	**2**	**1**	1		1			**1**		**3**	**3**		**1**

318COE13 **AD HOC NETWORK** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Study various issues in Ad-Hoc
- Study various issues in Ad-Hoc Network Routing & TCP
- Study WSN Architecture and Protocols
- Study WSN Routing, Localization, QoS and Mesh Networks

UNIT I INTRODUCTION **9**

Issues in Ad-Hoc Wireless Networks. MAC Protocols – Issues, Classifications of MAC protocols, Multi channel MAC & Power control MAC protocol

UNIT II AD-HOC NETWORK ROUTING & TCP **9**

Issues – Classifications of routing protocols – Hierarchical and Power aware. Multicast routing – Classifications, Tree based, Mesh based. Ad Hoc Transport Layer Issues. TCP Over Ad Hoc – Feedback based, TCP with explicit link, TCP-Bus, Ad Hoc TCP, and Split TCP

UNIT III WSN –MAC **9**

Introduction – Sensor Network Architecture, Data dissemination, Gathering. MAC Protocols – self-organizing, Hybrid TDMA/FDMA and CSMA based MAC

UNIT IV WSN ROUTING, LOCALIZATION & QOS **9**

Issues in WSN routing – OLSR, AODV. Localization – Indoor and Sensor Network Localization. QoS in WSN

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

UNIT V MESH NETWORKS **9**

Necessity for Mesh Networks – MAC enhancements – IEEE 802.11s Architecture – Opportunistic routing – Self configuration and Auto configuration – Capacity Models – Fairness – Heterogeneous Mesh Networks – Vehicular Mesh Networks

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Identifying various issues in Ad-Hoc Networks

CO2: Identifying various issues in Ad-Hoc Network Routing & TCP

CO3: Knowledge in WSN Architecture and Protocols

CO4: Knowledge in WSN Routing, Localization, QoS

CO5: Gain Knowledge in Mesh Networks

REFERENCE BOOKS

1. C.SivaRam MurthyandB.Smanoj," AdHocWirelessNetworks–Architecturesand Protocols",PearsonEducation, 2004
2. FengZhaoandLeonidasGuibas,"WirelessSensor Networks",MorganKaufman Publishers, 2004
3. C.K.Toh,"AdHocMobileWirelessNetworks",PearsonEducation,2002
4. Thomas KragandSebastinBuettrich,"WirelessMeshNetworking",O'Reilly Publishers, 2007

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Identifying various issues in Ad-Hoc Networks	**3**	**2**	**1**	1		1			**1**		**3**	**1**		**1**
Co2	Identifying various issues in Ad-Hoc Network Routing & TCP	**3**	**2**	**1**	1		1			**1**		**3**	**1**		**1**
Co3	Knowledge in WSN Architecture and Protocols	**3**	**2**	**1**	1		1			**1**		**3**	**1**		**1**
Co4	Knowledge in WSN Routing, Localization, QoS	**3**	**2**	**1**	1		1			**1**		**3**	**1**		**1**
Co5	Gain knowledge in Mesh Networks	**3**	**2**	**1**	1		1			**1**		**3**	**1**		**1**

318COE14 ADVANCED TECHNIQUES FOR WIRELESS RECEPTION **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Learn the basic concepts of the signal processing for wireless reception.
- Study the adaptive array processing in TDMA and CDMA system.
- Study the Linear and nonlinear predictive techniques. Code- aided techniques.
- Acquire knowledge in the blind equalization and signal processing of the fading MIMO channels

UNIT I INTRODUCTION TO WIRELESS RECEPTION **9**

Wireless signalling environment, Basic signal processing for wireless reception, Linear receivers for synchronous CDMA.

UNIT II DETECTION AND PERFROMANCE **9**

Blind and group-blind multiuser detection methods.Performance issues. Robust multiuser detection for non Gaussian channels; asymptotic performance , implementation aspects.

UNIT III TDMA AND CDMA **9**

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

Adaptive array processing in TDMA systems. Optimum space-time multiuser detection. Turbo multiuser detection for synchronous and turbo coded CDMA.

UNIT IV ADAPTIVE TECHNIQUES 9

Narrowband interface suppression. Linear and nonlinear predictive techniques. Code- aided techniques. Performance comparison.

UNIT V MIMO CHANNELS 9

Bayesian and sequential Montecarlo signal processing. Blind adaptive equalization of MIMO channels .Signal processing for fading channels. Coherent detection based on the EM algorithm. Decision-feedback differential detection. Signal processing for coded OFDM systems.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Understand the linear receivers for synchronous CDMA.
CO2: Analyze the various application of the TDMA.
CO3: Comparing performance of the various wireless coding techniques.
CO4: Design the signal processing and coherent detection of the OFDM and EM algorithm.
CO5: Understand about MIMO Channels

REFERENCE BOOKS

1. X.Wang&H.V.Poor, Wireless Communication Systems, Pearson, 2004
2. R.Janaswamy, Radio Wave Propagation and Smart Antennas for Wireless
3. Communication, Kluwer, 2001.
4. Mohamed Ibnkahla, Signal Processing for Mobile Communications, CRC Press, 2005.
5. A.V.H. Sheikh, Wireless Communications Theory & Techniques, Kluwer Academic
6. Publications, 2004
7. A.Paulrajetal, Introduction to Space-time Wireless Communications, Cambridge University Press, 2003.

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Understand the linear receivers for synchronous CDMA	**3**	**2**	**1**	1		1			**1**		**3**	**3**	**1**	
Co2	Analyze the various application of the TDMA	**3**	**2**	**1**	1		1			**1**		**3**	**3**	**1**	
Co3	Comparing performance of the various wireless coding techniques.	**3**	**2**	**1**	1		1			**1**		**3**	**3**	**1**	
Co4	Design the signal processing and coherent detection of the OFDM and EM algorithm	**3**	**2**	**1**	1		1			**1**		**3**	**3**	**1**	
Co5	Understand about MIMO Channels	**3**	**2**	**1**	1		1			**1**		**3**	**3**	**1**	

318COE15 Wavelets and Multiresolution Processing L T P C

3 0 0 3

COURSE OBJECTIVES

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

- Study the basics of signal representation and Fourier theory
- Understand Multi Resolution Analysis and Wavelet concepts
- Study the wavelet transform in both continuous and discrete domain
- Understand the design of wavelets using Lifting scheme

UNIT I FUNDAMENTALS 9

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- Fourier Theory: Fourier series expansion, Fourier transform, Short time Fourier transform, Time-frequency analysis

UNIT II MULTI RESOLUTION ANALYSIS 9

Definition of Multi Resolution Analysis (MRA) – Haar Basis – Construction of General Orthonormal MRA – Wavelet Basis for MRA – Continuous Time MRA Interpretation for the DTWT – Discrete Time MRA – Basis Functions for the DTWT – PRQMF Filter Banks

UNIT III CONTINUOUS WAVELET TRANSFORMS 9

Wavelet Transform – Definition and Properties – Concept of Scale and its Relation with Frequency – Continuous Wavelet Transform (CWT) – Scaling Function and Wavelet Functions (Daubechies Coiflet, Mexican Hat, Sinc, Gaussian, Bi Orthogonal)– Tiling of Time – Scale Plane for CWT

UNIT IV DISCRETE WAVELET TRANSFORM 9

Filter Coefficients – Choice of Wavelet Function Coefficients – Derivations of Daubechies Wavelets – Mallat's Algorithm Filter Bank and Sub Band Coding Principles – Wavelet Filters – Inverse DWT Computation by Filter Banks – Basic Properties of Filter Coefficients – Choice of Wavelet Function Coefficients – Derivations of Daubechies Wavelets – Mallat's Algorithm for DWT – Multi Band Wavelet Transforms Lifting Scheme- Wavelet Transform Using Polyphase Matrix Factorization – Geometrical Foundations of Lifting Scheme – Lifting Scheme in Z –Domain.

UNIT V APPLICATIONS 9

Wavelet methods for signal processing- Image Compression Techniques: EZW–SPHIT Coding – Image Denoising Techniques: Noise Estimation – Shrinkage Rules – Shrinkage Functions – Edge Detection and Object Isolation, Image Fusion, and Object Detection

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

CO1: Understand Fourier tools to analyse signals
CO2: Knowledge in MRA and representation using wavelet bases
CO3: Knowledge in various wavelet transforms
CO4: Knowledge in various design wavelet transform
CO5: Apply wavelet transform for various signal & image processing applications

TEXT BOOKS

1. Rao R M and A S Bopardikar, —Wavelet Transforms Introduction to theory and Applications, Pearson Education, Asia, 2000
2. L.Prasad&S.S.Iyengar, Wavelet Analysis with Applications to Image Processing, CRC Press, 1997

REFERENCE BOOKS

1. J. C. Goswami and A. K. Chan, “Fundamentals of wavelets: Theory, Algorithms and Applications" Wiley Interscience Publication, John Wiley & Sons Inc., 1999
2. M. Vetterli, J. Kovacevic, “Wavelets and subband coding" Prentice Hall Inc, 1995
3. Stephen G. Mallat, “A wavelet tour of signal processing" 2 nd Edition Academic Press, 2000
4. Soman K P and Ramachandran K I, —Insight into Wavelets From Theory to practice, Prentice Hall, 2004

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Understand Fourier tools to analyse signals	**3**	**2**	**1**	1		1			**1**		**3**	**3**		**1**
Co2	Knowledge in MRA and representation using wavelet bases	**3**	**2**	**1**	1		1			**1**		**3**	**3**		**1**
Co3	Knowledge in various wavelet transforms	**3**	**2**	**1**	1		1			**1**		**3**	**3**		**1**
Co4	Knowledge in various design wavelet transform	**3**	**2**	**1**	1		1			**1**		**3**	**3**		**1**
Co5	Apply wavelet transform for various signal & image processing applications	**3**	**2**	**1**	1		1			**1**		**3**	**3**		**1**

318COE16 **SOFT COMPUTING** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Study Conventional and Computational AI
- Study Genetic Algorithms and Application
- Learn Neural Networks and Fuzzy Logic Concepts
- Design Neuro-Fuzzy model

UNIT I INTRODUCTION TO SOFT COMPUTING AND NEURAL NETWORKS 9

Evolution of Computing - Soft Computing Constituents – From Conventional AI to Computational Intelligence - Machine Learning Basics

UNIT II GENETIC ALGORITHMS 9

Introduction to Genetic Algorithms (GA) – Applications of GA in Machine Learning - Machine Learning Approach to Knowledge Acquisition

UNIT III NEURAL NETWORKS 9

Machine Learning Using Neural Network, Adaptive Networks – Feed forward Networks – Supervised Learning Neural Networks – Adaptive Resonance architectures – Advances in Neural Learning Neural Networks – Radial Basis Function Networks - Reinforcement Learning – Unsupervised networks.

UNIT IV FUZZY LOGIC 9

Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership FunctionsFuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems – Fuzzy Expert Systems – Fuzzy Decision Making.

UNIT V NEURO-FUZZY MODELING 9

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling – Classification and Regression Trees – Data Clustering Algorithms – Rulebase Structure Identification – Neuro-Fuzzy Control – Case studies.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Knowledge in Conventional and Computational AI

CO2: Knowledge in Genetic Algorithms and Application

CO3: Knowledge in Neural Networks

CO4: Knowledge in Fuzzy Logic Concepts

CO5: Design Neuro-Fuzzy modeling

TEXT BOOKS

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, "Neuro-Fuzzy and Soft Computing", Prentice-Hall of India, 2003
2. George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic-Theory and Applications", Prentice Hall, 1995
3. James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Pearson Edn., 2003

REFERENCE BOOKS

1. Mitchell Melanie, "An Introduction to Genetic Algorithm", Prentice Hall, 1998
2. David E. Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", Addison Wesley, 1997

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Knowledge in Conventional and Computational AI	**3**	**2**	**1**						**1**		**3**	**1**		**1**
Co2	Knowledge in Genetic Algorithms and Application	**3**	**2**	**1**						**1**		**3**	**1**		**1**
Co3	Knowledge in Neural Networks	**3**	**2**	**1**						**1**		**3**	**1**		**1**
Co4	Knowledge in Fuzzy Logic Concepts	**3**	**2**	**1**						**1**		**3**	**1**		**1**
Co5	Design Neuro-Fuzzy modeling	**3**	**2**	**1**						**1**		**3**	**1**		**1**

318COE17 INFORMATION THEORY AND CODING L T P C

3 0 0 3

COURSE OBJECTIVES

- Review the concept of Introduction to Probability theory, random variables
- Understand the memoryless finite Schemes for Channels
- Understand the concept of Continuous channel
- Learn the different Encoding Process

UNIT I REVIEW OF PROBABLITY 9

Introduction to Probability theory, Axiom of Probability- Conditional Probability – Total Probablity – Baye's Theorem, Random variables Discrete and Continuous Random variable moments and moment generating function and their properties

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

UNIT II RANDOM PROCESS 9

Classification - Stationary - Spectral decomposition - Response of linear system to random inputs

UNIT III MEMORYLESS FINITE SCHEMES 9

Self information measure - Entropy function - Conditional Entropies - Characteristics of Entropy function - Derivation of the noise characteristics of a channel - Mutual information - Redundancy - Efficiency and channel capacity - capacities of channels with symmetric noise structure.

UNIT IV CONTINUOUS CHANNELS 9

Definitions of different entropies - Mutual information - Maximization of the entropy of a continuous random variable - Entropy maximization problems - Channel capacity under the influence of additive white Gaussian Noise.

UNIT V ELEMENTS OF ENCODING 9

Separable binary codes - Shannon - Fano encoding - Necessary and sufficient conditions for noiseless coding - Shannon's binary coding - fundamental theorem of discrete noise-less coding - Huffman's code - Gilbert Moore coding - Fundamental theorem of discrete coding in presence of noise - Error-detecting and error-correcting codes - Hamming's single error correcting code.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Demonstrate the Probability theory, random variables and Random Process
CO2: Demonstrate the Probability Random Process
CO2:Understand the memory less finite Schemes for Channels
CO3: Knowledge in Continuous channel
CO4: Compute to perform different encoding Process

REFERENCE BOOKS

1. Viterbei A &Omura J.K, "Principles of Digital Communication and Coding", McGraw Hill, 1979.
2. Satyanarayana P.S. "Probability Theory - An Introduction", Dayaram Publications" 1990.
3. Mansuripur.M.A, "Introduction to Information Theory" - Prentice Hall Inc. 1990
4. Srinath .M.D and Rajasekaran .P.K "An Introduction to Statistical Signal Processing with Application, Prentice Hall, 1993
5. Joya Thomas, M.Cover "Elements of Information theory", John Wiley, 1991
6. Richard.B.wells, "Applied Coding and Information Theory for Engineers", Prentice Hall, 1998

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Demonstrate the Probability theory, random variables and Random Process	3	2	1						1		3	3	1	
Co2	Demonstrate the Probability Random Process	3	2	1						1		3	3	1	
Co3	Understand the memory less finite Schemes for Channels	3	2	1						1		3	3	1	
Co4	Knowledge in Continuous channel	3	2	1						1		3	3	1	
Co5	Compute to perform different encoding Process	3	2	1						1		3	3	1	

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

318COE18 **SPREAD SPECTRUM COMMUNICATION SYSTEMS** **L T P C**
3 0 0 3

Course Objectives

- Learn the fundamentals of Spread Spectrum Communications
- Study various types of spread spectrum signals.
- Understand the synchronization schemes used for spread spectrum communications.
- Study the applications of spread spectrum communications.

UNIT I INTRODUCTION **9**

Origins of SS communications – Advantages of Spectrum spreading –Types of techniques used for spread spectrum – Processing gain and other fundamental parameters – Jamming methods – Linear Feedback shift register sequence generation – M-sequence and their statistical properties. Introduction to Non-linear sequences – Gold codes. Kasami sequences & chaotic sequences

UNIT II DIRECT SEQUENCE SPREAD SPECTRUM SYSTEM **9**

Coherent direct sequence systems – Model of a DS/BPSK system, Chernoff bound – Performance of encoded DS/BPSK – Constant power and pulse jammer. Coded DS/BPSK Performance for known and unknown channel states.

UNIT III FREQUENCY HOPPING SS SYSTEM **9**

Non-coherent FH system model – Uncoded FH/BFSK performance under constant power broadband jammer – Partial band noise jammer – Multitone jammer. Coded FH/BFSK performance for partial and multitone jammer. Performance of FH/MDPSK in the presence of partial band mutitone jamming

UNIT IV SYNCHRONIZATION OF SS RECEIVERS **9**

Acquisition and tracking in DS SS receivers & FH SS receivers – Sequential estimation – Matched filter techniques of acquisition and tracking – Delay locked loop – Tau-Dither loop.

UNIT V APPLICATIONS **9**

Space systems – Satellite communication. Anti jam military communication – Low probability of intercept communication – Mobile communications.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Understanding of applications of spread spectrum communication systems.
CO2: Knowledge of various types of spread spectrum communication systems.
CO3: Knowledge of different techniques and aspects of synchronization.
CO4: Knowing the method of implementing spread spectrum systems.
CO5: Implement the applications

Reference Books

1. R.C. Dixon, “Spread spectrum systems”, 2nd Edition, John Wiley, 1984.
2. M.K. Simon, J.K.Omura, R.A. Schiltz and B.K.Levitt, “Spread spectrum communication”, Vol-I, II & IV, Computer Science Press, USA, 1985.
3. G.R.Coopeand, CD.Mc.Gillem, “Modern communications and spread spectrum”, McGraw Hill, 1986.

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Understanding of applications of spread spectrum communication systems.	**3**	**2**	**1**						**1**		**3**	**3**	**1**	
Co2	Knowledge of various types of spread spectrum communication systems	**3**	**2**	**1**						**1**		**3**	**3**	**1**	
Co3	Knowledge of different techniques and aspects of synchronization.	**3**	**2**	**1**						**1**		**3**	**3**	**1**	
Co4	Knowing the method of implementing spread spectrum systems.	**3**	**2**	**1**						**1**		**3**	**3**	**1**	
Co5	Implement the applications	**3**	**2**	**1**						**1**		**3**	**3**	**1**	

G RANGANATH

Digitally signed by G RANGANATH
DN: C=IN, O=PERSONAL, T=5743, OID.2.5.4.65=477ffb4dbbd048fca3ebc0819eac5932, Phone=52395e01ffcfdff207f2ee203111911d02facc9c55479d3d2d69ce80f3fdcbd3, PostalCode=635109, S=Tamil Nadu, SERIALNUMBER=fd0cabc4c841372f49b7553888e0d3fd2a47f2cf77abb2bc845fe5200c1fb253, CN=G RANGANATH
Reason: I am the author of this document
Location:
Date: 2023-01-12 14:58:31

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130