Dr. Mahalingam College of Engineering and Technology

(An Autonomous Institution)

Pollachi - 642 003

Curriculum and Syllabus

M.E. COMMUNICATION SYSTEMS

SEMESTER I to IV

REGULATIONS 2014

DR MAHALINGAM

MCET

COLLEGE OF ENGINEERING AND TECHNOLOGY

Enlightening Technical Minds

Department of Electronics and Communication Engineering

Regulations 2014

Revised Curriculum for M.E - Communication Systems from Semester I to IV
(2018 Batch)

SEMESTER I

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
140CM0102	Advanced Digital Communication Techniques	3	0	0	3	100
140CM0103R	Advanced Digital Signal Processing	3	0	2	4	100
140CM0104	Microwave Circuit Design	3	0	0	3	100
140CM0105	Optical Communication Networks	3	0	0	3	100
140CM0106	Applied Mathematics for Communication Engineers	3	1	0	4	100
xxx	Elective I	3	0	0	3	100
PRACTICAL						
140CM0107	Communication System Laboratory	0	0	3	2	100
TOTAL		**18**	**1**	**5**	**22**	**700**

SEMESTER II

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
140CM0201	Wireless and Cellular Communication Engineering	3	0	0	3	100
140CM0202	Multimedia Compression	3	0	0	3	100
140CM0203R	Advanced Radiation Systems	3	0	0	3	100
140CM0204	RF System Design	3	0	0	3	100
xxx	Elective II	3	0	0	3	100
xxx	Elective III	3	0	0	3	100
PRACTICAL						
140CM0207	RF and Networks Laboratory	0	0	3	2	100
TOTAL		**18**	**0**	**3**	**20**	**700**

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SEMESTER III

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
XXX	Elective IV	3	0	0	3	100
XXX	Elective V	3	0	0	3	100
XXX	Elective VI	3	0	0	3	100
PRACTICAL						
140CM0307	Project Work Phase –I	0	0	12	6	200
TOTAL		**9**	**0**	**12**	**15**	**500**

SEMESTER IV

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
140CM0407	Project Work Phase –II	0	0	24	12	400
TOTAL		-	-	**24**	**12**	**400**

Total Credits: 69

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LIST OF ELECTIVES

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
140CM9111	Wireless Systems and Standards	3	0	0	3	100
140CM9112	Wireless Security	3	0	0	3	100
140CM9113	DSP Processor Architecture and programming	3	0	0	3	100
140CM9114	Digital Speech Signal Processing	3	0	0	3	100
140CM9115	Network Routing Algorithms	3	0	0	3	100
140CM9116	Global Positioning Systems	3	0	0	3	100
140CM9117	Wireless Ad Hoc Networks	3	0	0	3	100
140CM9118	Soft Computing	3	0	0	3	100
140CM9119	Digital Communication Receivers	3	0	0	3	100
140CM9120	Wavelets and Subband Coding	3	0	0	3	100
140CM9121	VLSI Signal processing	3	0	0	3	100
140CM9122	High Performance Computer Networks	3	0	0	3	100
140CM9123	Adaptive Signal Processing	3	0	0	3	100
140CM9124	High Speed Switching Architectures	3	0	0	3	100
140CM9125	LabVIEW Based Signal Processing	3	0	0	3	100
140CM9126	Microwave Integrated Circuits	3	0	0	3	100
140CM9127	Internetworking and Multimedia	3	0	0	3	100
140CM9128	Radar and Navigational Aids	3	0	0	3	100
140CM9129	Research Methodology	3	0	0	3	100
140CM9130	VLSI for Wireless Communication	3	0	0	3	100
140CM9131	Wireless Sensor Networks Technology	3	0	0	3	100
140CM9132	Multiuser detection	3	0	0	3	100
140CM9133	Smart antennas	3	0	0	3	100
140CM9134	Spread spectrum communication	3	0	0	3	100
140CM9135	FPGA Based System Design	3	0	0	3	100

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140CMO103R ADVANCED DIGITAL SIGNAL PROCESSING 3 0 2 4

AIM:
To provide students with a solid understanding of a number of important and related advanced topics in digital signal processing such as filters, power spectrum estimation, signal modelling and adaptive filtering.

OBJECTIVES:
On completion of the course, the student will be able to:

- Understand fundamental concepts of discrete random process.
- Compute the spectral estimation by non parametric methods
- Apply various estimators and predictor to filters.
- Know the concepts and applications of multirate signal processing

UNIT I INTRODUCTION (9+6)

Random process: Expectations, Moments, Ergodicity, Discrete-Time Random Processes, Stationary process, autocorrelation and auto covariance functions, Spectral representation of random signals, Properties of power spectral density, Gaussian process and White noise process, Applications– autocorrelation for identifying voiced/unvoiced speech signal.

UNIT II POWER SPECTRUM ESTIMATION (9+6)
Introduction – Non parametric methods - Periodogram – Modified Periodogram - Bartlett, Welch & Blackman Tukey methods - Performance comparison - Parametric methods - Auto Regressive (AR) spectrum estimation - Relationship between autocorrelation and model parameters – Moving Average and Auto Regressive Moving Average spectrum estimation

UNIT III LINEAR PREDICTION (9+6)
Model based approach - AR, MA, ARMA Signal modeling - Parameter estimation using Yule-Walker method - Least mean squared error criterion. Linear prediction and optimum linear filters, forward and backward linear prediction filters, solution of normal equations using Levinson–Durbin recursion, – Lattice realization-Wiener filter - Discrete Wiener Hoff equations – Mean square error. Applications of Wiener filter for Prediction, and noise cancellation. Introduction to Discrete Kalman Filter.

UNIT IV ADAPTIVE FILTERS (9+6)
Introduction – Applications – System identification – Inverse modeling – Prediction - Interference Cancellation - Adaptive linear combiner – Performance function – Gradient and Minimum Mean Square error – Gradient search by the method of steepest descent – LMS algorithm – convergence of LMS algorithm – Learning curve – Misadjustment – RLS algorithm.

UNIT V MULTIRATE SIGNAL PROCESSING (9+6)
Representation of discrete time signals – down sampling – up sampling - cascading sampling rate convertors - Decimation with transversal filters – interpolation with transversal filters – decimation with polyphase filters – interpolation with polyphase filters – decimation and interpolation with rational sampling factors - multistage implementation of sampling rate convertors. Two channel filter banks - QMF filter banks - Perfect Reconstruction Filter banks - Applications – speech and audio coding – image and video coding.

LABORATORY COMPONENT:

1. Voiced/Unvoiced speech signal classification using Auto correlation.
2. Non parametric method of power spectrum estimation
   a. Periodogram
   b. Modified Periodogram
   c. Bartlett's method
   d. Welch method
   e. Blackman-Tukey method
3. Linear prediction and Noise Cancellation using Wiener filter
4. Adaptive noise cancellation using LMS and RLS Algorithm
5. Design of decimator and Interpolator and verification of Noble identities
6. Two channel filter banks and its application to speech signal processing

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1. Hayes M H, "Statistical Digital Signal Processing and Modeling ", Wiley, New York, 2008.
2. Simon Haykin "Adaptive Filter Theory", Fourth edition, Pearson education, 2010.
3. WidrowB and Stearns .S D, "Adaptive Signal Processing", Pearson education, 2009.
4. Fliege N J, "Multirate Digital Signal Processing", John Wiley and sons, 2010.
5. Vaidyanathan P P, "Multirate Systems and Filter banks", Prentice Hall, 2008.
6. Ifeachor E C and Jervis B. W, "Digital Signal Processing: A Practical Approach", Prentice Hall, 2009.
7. Lawrence R. Rabiner, Ronald W. Schafer, "Theory and Applications of Digital Speech Processing", Pearson, 2011.

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2. www.iitg.vlab.co.in/?sub=59&brch=164&sim=613&cnt=1
3. www.eas.uccs.edu/~mwickert/ece5655/lecture_notes/ARM/ece5655_chap8.pdf

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140CM0203R ADVANCED RADIATION SYSTEMS 3 0 0 3

AIM:
To describe the advanced design principles used in the radiating systems and to design different types of antennas.

OBJECTIVES:

- Understand different types of antennas and sources of radiation
- Know the radiation characteristics of Aperture antenna using suitable principles
- Understand the concept of Microstrip antennas.
- Learn the different methods of antenna measurements

UNIT I ANTENNA FUNDAMENTALS 10
Antenna Radiation mechanism,Radiation pattern, near and far-field regions, reciprocity, directivity and gain, effective aperture, polarization, input impedance, efficiency, Friis transmission equation, radiation integrals and auxiliary potential functions.Radiation from surface and line current distributions – dipole, monopole, loop antenna, ImageTheory, Introduction to numerical techniques

UNIT II RADIATION FROM APERTURES 9
Field equivalence principle, Radiation Equations, Radiation from Rectangular and Circular apertures-Uniform aperture distribution on an infinite ground plane, Babinet's Principle, Slot antenna, Horn antenna, Reflector antenna.

UNIT III ARRAY ANTENNA 9
N-Element UniformLinear array-end fire and broad side array Phase andfrequency scanned arrays, Linear array synthesis techniques-Binomial and Chebyshev distributions, Smart antenna array-Benefits of Smart antennas, Types of Smart antenna, Fixed and switched beam antenna system, Adaptive Beam forming.

UNIT IV MICRO STRIP ANTENNA 8
Radiation Mechanism from patch, Excitation techniques, Microstrip dipole, Rectangular patch, Circular patch,-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 ANTENNA AND MEASUREMENTS 9
Mobile phone antenna-base station, hand set antenna-PIFA, UWB antenna, BroadbandAntennas, EMI/EMC,Antenna factors, Antenna measurement and instrumentation–Antenna Ranges, Gain and Impedance measurement

REFERENCES:

1. Balanis.A, “Antenna Theory Analysis and Design”, John Wiley and Sons, NewYork, 1982.
2. Krauss.J.D, “Antennas”, 2nd Edition, John Wiley and sons, New York, 1997.
3. Bahl. I.J. and Bhartia.P. ,"Microstrip Antennas", Artech House,Inc.,1980
4. Stutzman. W.L. and Thiele. G.A., "Antenna Theory and Design", 2nd Edition,John Wiley & Sons Inc.,1998.
5.Liberti, JR and Theodore Rappaport, “Smart Antennas for Wireless communication” Prentice Hall of India, 1999
6. Ahmed El-Zooghby, “Smart Antenna Engineering” Artech House, 2008

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140CM0106 APPLIED MATHEMATICS FOR COMMUNICATION ENGINEERS 3 1 0 4

AIM:

To describe the ideas of Linear algebra, linear programming and non linear programming for signal processing and Communication.

OBJECTIVES:

On completion of the course, the student will be able to:

- Introduce the fundamental ideas of linear algebra
- Understand the concepts of linear programming
- Know the importance of non linear programming

UNIT I VECTOR SPACES (9+6)

Real vector spaces and subspaces – Linear independence - Basis and dimension – Row space, column space and null space- Rank and nullity.

UNIT II INNER PRODUCT SPACES (9+6)

Inner products – Angle and orthogonality in inner product spaces – Orthonormal bases: Gram-Schmidt process, and QR decomposition – Best approximation: Least squares – change of basis – Orthogonal matrices.

UNIT III LINEAR TRANSFORMATIONS (9+6)

Linear transformation- Matrix of linear transformation- diagonalization- applications to differential equations - symmetric matrices- positive definite matrices- similar matrices- singular value decomposition.

UNIT IV LINEAR PROGRAMMING (9+6)

Formulation – Graphical solution – Simplex method – Big M method - Two phase method - Transportation problems - Assignment models.

UNIT V NONLINEAR PROGRAMMING (9+6)

Formulation of non linear programming problem-constrained optimization with equality constraints-Graphical method of non linear programming problem involving only two variables-Kuhn Tucker conditions with non negative constraints-Wolfe's modified simplex method.

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1.David C Lay, "Linear Algebra and its Applications",Pearson Education Asia,New Delhi,2003.
2.Howard A Anton, "Elementary Linear Algebra",John Wiley& Sons,Singapore,8th Edition,2000.
3.Gupta P.K, HiraD.S,"OperationsReasearch", S.Chand& Co.,1999.
4.Gilbert Strang, "Linea Algebra and its Applicatons", Brooks/Cole Ltd ,New Delhi,3rdEditionThird edition,2003.
5.Seymour Lipschutz and Marc Lipson,"Schaum's Outline of Linear Algebar", McGraw Hill Trade,New Delhi,3rd Edition,2000.

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