SONA COLLEGE OF TECHNOLOGY, SALEM-5

(An Autonomous Institution)

M.E- Electronics and Communication Engineering

(Communication Systems)

CURRICULUM and SYLLABI

[For students admitted in 2018-2019]

M.E / M.Tech Regulation 2015

Approved by BOS and Academic Council meetings

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME I Semester under Regulations 2015
Electronics and Communication Engineering
Branch: M.E. Communication Systems

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	P15COS101	Applied Mathematics for Electronics Engineers	3	2	0	4
2	P15COS102	Advanced Digital Signal Processing	4	0	0	4
3	P15COS103	Advanced Modulation and Coding Techniques	3	0	0	3
4	P15COS104	Optical Communication Networks	3	0	0	3
5	P15COS105	Advanced Radiation Systems	3	0	0	3
6	P15COS106	Wireless Networks	3	0	0	3
Practical						
7	P15COS107	Communication System Laboratory - I	0	0	4	2
					Total Credits	**22**

Approved by

Chairman, Electronics and Communication Engineering BOS
Dr.R.S.Sabeenian

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council &Principal
Dr.S.R.R.Senthil Kumar

Copy to:-
HOD/ECE, First Semester ME COS Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME II Semester under Regulations 2015
Electronics and Communication Engineering
Branch: M.E. Communication Systems

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	P15COS201	Wireless Communication Networks	4	0	0	4
2	P15COS202	RF System Design	3	0	0	3
3	P15COS203	Microwave Integrated Circuits	3	2	0	4
4	P15COS501	**Professional Elective -** Multimedia Compression Techniques	3	0	0	3
5	P15COS507	**Professional Elective -** Communication Network Security	3	0	0	3
6	P15COS518	**Professional Elective -** Advanced Digital Image Processing	3	0	0	3
Practical						
7	P15COS204	Communication Systems Laboratory - II	0	0	4	2
					Total Credits	**22**

Approved by

Chairman, Electronics and Communication Engineering BOS	**Member Secretary, Academic Council**	**Chairperson, Academic Council &Principal**
Dr.R.S.Sabeenian	**Dr.R.Shivakumar**	**Dr.S.R.R.Senthil Kumar**

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Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME III Semester under Regulations 2015
Electronics and Communication Engineering
Branch: M.E. Communication Systems

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	P15COS514	**Professional Elective**- Advanced Fiber Optic Technologies	3	0	0	3
2	P15COS516	**Professional Elective**- Wireless Sensor Networks	3	0	0	3
3	P15COS607	**Open Elective**- Human Resource Development	3	0	0	3
Practical						
4	P15COS301	Project Phase - I	0	0	16	8
					Total Credits	**17**

Approved by

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HOD/ECE, Third Semester ME COS Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME IV Semester under Regulations 2015
Electronics and Communication Engineering
Branch: M.E. Communication Systems

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Practical						
1	P15COS401	Project Phase – II	0	0	24	12
					Total Credits	**12**

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Dr.R.Shivakumar

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Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME I Semester under Regulations 2015
Electronics and Communication Engineering
Branch: M.E. Communication Systems

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	P15COS101	Applied Mathematics for Electronics Engineers	3	2	0	4
2	P15COS102	Advanced Digital Signal Processing	4	0	0	4
3	P15COS103	Advanced Modulation and Coding Techniques	3	0	0	3
4	P15COS104	Optical Communication Networks	3	0	0	3
5	P15COS105	Advanced Radiation Systems	3	0	0	3
6	P15COS106	Wireless Networks	3	0	0	3
Practical						
7	P15COS107	Communication System Laboratory - I	0	0	4	2
					Total Credits	**22**

Approved by

Chairman, Electronics and Communication Engineering BOS
Dr.R.S.Sabeenian

Member Secretary, Academic Council
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Dr.S.R.R.Senthil Kumar

Copy to:-
HOD/ECE, First Semester ME COS Students and Staff, COE

P15COS101	APPLIED MATHEMATICS FOR ELECTRONICS ENGINEERS	L	T	P	C	Marks
		3	2	0	4	100

COURSE OUTCOMES

At the end of each unit, the students will be able to -

1. Comprehend main concepts and propositions of Fuzzy Logic Principles.
2. Apply the various methods of matrix factors to solve the engineering problems.
3. Use the decompositions of the matrix and rank reducing approximations for engineering applications.
4. Apply and analyze the Dynamic Programming for problem solving.
5. Analyze problem solving capability of queuing models.

UNIT I	**FUZZY LOGIC** Classical Logic – Multi Valued Logics – Basic Concepts of Fuzzy Sets – Fuzzy Complements – Fuzzy Propositions – Equivalence and Similarity Relations – Problems on Fuzzy Propositions – Fuzzy Quantifiers.	**15**
UNIT II	**MATRIX THEORY** Some Important Matrix Factorizations –The Cholesky's Factorization – Unitary Matrices – Least Square Filters – Computing the QR Factorization – House Holder Transformations – QR Factorization Using Given Rotations.	**15**
UNIT III	**SINGULAR VALUE DECOMPOSITION** Pseudo Inverses and the SVD – Rank Reducing Approximations – Effective Rank – Application of SVD – Toplitz Matrices and Some Applications – Durbin's Algorithm – Optimal Predictors and Toplitz Inverses – Toplitz Equations with a General RHS.	**15**
UNIT IV	**DYNAMIC PROGRAMMING** Recursive Nature of Computations in DP – Forward and Backward Recursion – Selected DP Applications – Knapsack Loading Model – Work Force Size Model – Equipment Replacement Model – Inventory Models – Problem of Dimensionality.	**15**
UNIT V	**QUEUING MODELS** Poisson Process – Markovian Queues – Single and Multi-Server Models (Problems Only) – Little's Formula – Steady State Analysis – Self Service Queue.	**15**
		Total: 75

REFERENCE BOOKS

1.	George J. Klir and Yuan, B., "*Fuzzy Sets and Fuzzy Logic, Theory and Applications"*, Prentice – Hall of India Pvt. Ltd., 1997.
2.	Moon, T.K., Sterling, W.C., "*Mathematical Methods and Algorithms for Signal Processing"*, Pearson Education, 2000.
3.	Richard Johnson, Miller & Freund's, "*Probability and Statistics for Engineers"*, 7th Edition, Prentice – Hall of India, Private Ltd., New Delhi, 2007.
4.	Taha, H.A., "*Operations Research, An introduction"*, 7th Edition, Pearson Education Editions, Asia, New Delhi, 2002.
5.	Donald Gross and Carl M. Harris, "*Fundamentals of Queuing theory"*, 2nd Edition, John Wiley and Sons, New York, 1985.

P15COS102	ADVANCED DIGITAL SIGNAL PROCESSING	L	T	P	C	Marks
		4	0	0	4	100

COURSE OUTCOMES

At the end of each unit, the students will be able to –

1. Apply discrete random signal processing techniques to estimate and analyze spectral power.
2. Analyze spectrum estimation using parametric methods and non-parametric methods.
3. Analyze and interpret the estimation and prediction using Wiener FIR & IIR filters techniques.
4. Describe and apply the adaptive filtering concepts for non-stationary environment.
5. Analyze the sampling rate conservation using different filter structures.

UNIT I	**DISCRETE RANDOM SIGNAL PROCESSING** Random Variables – Jointly Distributed Random Variables – Linear Mean Square Estimation – Parameter Estimation – Bias and Consistency – Ensemble Averages – Stationary Processes – Autocorrelation and Auto Covariance Matrices – Power Spectrum – Spectral Factorization – Filtering Random Processes – Low Pass Filtering of White Noise.	**12**
UNIT II	**SPECTRUM ESTIMATION** Non–Parametric Methods – The Periodogram – Performance of the Periodogram – Modified Periodogram – Bartlett and Welch Methods – Blackman-Tukey Method – Performance Comparisons – Minimum Variance Spectrum Estimation – Parametric Methods of AR – MA – ARMA.	**12**
UNIT III	**LINEAR ESTIMATION AND PREDICTION** 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 – IIR Wiener Filter.	**12**
UNIT IV	**ADAPTIVE FILTERS** FIR Adaptive Filters – Adaptive Filter based on Steepest Descent Method – LMS Algorithm – Normalized LMS – Adaptive Channel Equalization – Adaptive Echo Cancellation – Adaptive Noise Cancellation – Adaptive Recursive Filters – RLS Adaptive Filters – Exponentially Weighted RLS – Sliding Window RLS.	**12**
UNIT V	**MULTIRATE DIGITAL SIGNAL PROCESSING** 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 Multi Resolution Analysis by the Wavelet Method.	**12**
		Total: 60

REFERENCE BOOKS

1.	Monson H. Hayes , "*Statistical Digital Signal Processing and Modeling"*, John Wiley and Sons, Inc., Singapore, 2013
2.	John G. Proakis , Dimitris G. Manolakis, "*Digital Signal Processing",* Pearson Education, 2002
3.	John G. Proakis et. al., "*Algorithms for Statistical Signal Processing"*, Pearson Education, 2002.
4.	Dimitris G. Manolakis et. al., "*Statistical and Adaptive Signal Processing"*, McGraw Hill, New York, 2000.

P15COS103	ADVANCED MODULATION AND CODING TECHNIQUES	L	T	P	C	Marks
		3	0	0	3	100

COURSE OUTCOMES

At the end of each unit, the students will be able to –

1. Describe and analyze the role of design approaches for coding and modulation techniques.
2. Analyze the performance of different receivers for AWGN and fading channels.
3. Describe and analyze the importance of Multicarrier systems.
4. Design and analyze trellis coded modulation techniques.
5. Design and apply turbo coding technique to detect and correct errors in communication systems.

UNIT I	**REVIEW OF DIGITAL MODULATION TECHNIQUES** Signal Space Representation – Vector Space Concepts – Signal Space Concepts – Orthogonal Expansion of Signals, Linear Modulation with Memory – Nonlinear Modulation with Memory – Spectral Characteristics of Digital Modulated Signals – Power Spectra of Linearly Modulated Signals – Spread Spectrum Modulation Techniques.	**9**
UNIT II	**RECEIVERS FOR AWGN AND FADING CHANNELS** Optimum Receivers for Signals Corrupted by AWGN – Correlation Demodulator – Matched Filter Demodulator – The Optimum Detector – The Maximum Likelihood Sequence Detector – Characterization of Fading Multipath Channels – Channel Correlation Functions and Power Spectra – Statistical Models for Fading Channel – RAKE Demodulator.	**9**
UNIT III	**MULTICARRIER SYSTEMS** OFDM – Generation of Sub-Carriers Using IFFT – Guard Time and Cyclic Extension – Windowing, Peak to Average Power Reduction Schemes – Generating Complementary Codes – Minimum Distance of Complementary Codes – Maximum-Likelihood Decoding of Complementary Codes – Suboptimal Decoding of Complementary Codes – Large Code Lengths, Multicarrier CDMA – System Design – Performance Parameters.	**9**
UNIT IV	**TRELLIS CODED MODULATION** 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 – Decoding Methods and Implementation Issues.	**9**
UNIT V	**TURBO CODING** Introduction – Turbo Code Concepts – Likelihood Functions – The Two Signal Class Case – Log-Likelihood Ratio – Principles of Iterative Decoding – Product Code Examples – Encoding with Recursive Systematic Codes – Feedback Decoder – MAP Algorithm – The State Metrics and the Branch Metrics – Calculating Forward and Reverse State Metric – MAP Decoding Examples – Reed-Solomon Codes – BCH Codes.	**9**
		Total: 45

REFERENCE BOOKS

1.	John G. Proakis, "*Digital Communication",* 4th Edition, Mc Graw Hill Publication, 2001.
2.	Richard Van Nee & Ramjee Prasad*., "OFDM for Multimedia Communications",* Artech House Publication, 2001.
3.	Bernard Sklar., "*Digital Communications",* Second Edition, Pearson Education, 2009.

P15COS104	OPTICAL COMMUNICATION NETWORKS	L	T	P	C	Marks
		3	0	0	3	100

COURSE OUTCOMES

At the end of each unit, the students will be able to -

1. Illustrate the optical network components for optical network communication networks.
2. Analyze the SONET/ SDH network architecture and protection schemes in optical networks.
3. Analyze the wavelength network components and network design of wavelength routing networks.
4. Explain the various blocks of high capacity networks.
5. Analyze the various requirements for optical network design and management.

UNIT I	**OPTICAL NETWORKING COMPONENTS** Optical Network Components – Couplers – Isolators & Circulators – Multiplexers & Filters – Grating – Fabry-Perot Filter – Multilayer Dielectric Thin Film Filter – Mach-Zhender Interferometers – Arrayed Waveguide Grating – Acousto Optic Tunable Filter – Optical Amplifiers – Switches – Wavelength Converters.	**9**
UNIT II	**OPTICAL NETWORK ARCHITECTURES** SONET / SDH Standards – Multiplexing – Layers – Frame Structure – Elements of SONET/SDH Infrastructure – Network Survivability – Basic Concepts – Protection in SONET/SDH – Protection in IP Networks – Optical Layer Protection Schemes.	**9**
UNIT III	**WDM NETWORK DESIGN** WDM Elements – Line Terminals – Add/Drop Multiplexer – Crossconnect – Optical Layer Cost Tradeoffs – LTD and RWA Problems – Dimensioning Wavelength-Routing Networks – Statistical Dimensioning Model – Maximum Load Dimensioning Models.	**9**
UNIT IV	**HIGH CAPACITY NETWORKS** Photonic Packet Switching – OTDM – Multiplexing and Demultiplexing – Synchronization – Header Processing – Buffering – Burst Switching – Access Networks – Network Architecture Overview – Enhanced HFC – FTTC – Future Access Networks.	**9**
UNIT V	**NETWORK DESIGN AND MANAGEMENT** Transmission System Engineering – System Model – Power Penalty – Transmitter – Receiver – Crosstalk – Dispersion – Fiber Nonlinearities – Control and Management – Network Management Functions – Configuration Management – Performance Management – Fault Management – Optical Safety – Service Interface.	**9**
		Total: 45

REFERENCE BOOKS

1. Rajiv Ramaswami and Kumar Sivarajan, "*Optical Networks: A Practical Perspective"*, Morgan Kaufmann, 3rd Edition, 2010.
2. Hussein T. Mouftab and Pin-Han Ho, "*Optical Networks: Architecture and Survivability"*, Kluwer Academic Publishers, 2002.
3. Biswanath Mukherjee, "*Optical Communication Networks"*, McGraw Hill, 1997.

P15COS105	ADVANCED RADIATION SYSTEMS	L	T	P	C	Marks
		3	0	0	3	100

COURSE OUTCOMES

At the end of each unit, the students will be able to -

1. Comprehend and describe an overview of antenna fundamentals and concepts of radiation.
2. Design and synthesize different types of antenna arrays.
3. Analyze and evaluate different types of aperture antennas.
4. Design and examine the microstrip patch antenna and feed network.
5. Design and analyze the performance of UWB, Leaky Wave Antennas and impact of antennas in medical applications.

UNIT I	**ANTENNA FUNDAMENTALS AND PARAMETERS** Introduction of Types of Antennas – Radiation Mechanism – Current Distribution on a Thin Wire Antenna – Antenna Performance Parameters – Vector Potential A and F – Far Field Radiations – Duality Theorem – Reciprocity and Reaction Theorem – Retarded Potential – Heuristic Approach and Maxwell's Equation Approach.	**9**
UNIT II	**ANTENNA ARRAYS** Two Element Array – N-element Linear Array – Uniform Amplitude and Spacing – Directivity – Design Procedure – Three Dimensional Characteristics – Rectangular to Polar Graphical Solution – Uniform Spacing and Nonuniform Amplitude – Planar Array – Circular Array – Mutual Coupling in Finite Arrays – Smart Antenna	**9**
UNIT III	**APERTURE RADIATION ANTENNA** Field Equivalence Principle – Radiation Equations – Rectangular Apertures – Circular Apertures – Design Considerations for Rectangular and Circular Apertures – Babinets Principle – Dielectric Covered Apertures – Aperture Admittance – Ground Plane Edge Effects.	**9**
UNIT IV	**MICROSTRIP ANTENNA** Basic Characteristics – Feeding and Analysis Methods – Rectangular Patch – Transmission Line Model – Cavity Model – Directivity – Circular Patch – Quality Factor – Bandwidth – Efficiency – Input Impedance – Coupling – Circular Polarization – Microstrip Array and Feed Networks.	**9**
UNIT V	**MODERN ANTENNA APPLICATIONS** Integrated Antennas for Wireless Personal Communications – Integrated Handset Antennas and Human Interactions – Antennas for Mobile and Portable Communication – Mobile Terminal Antennas – Base Station Antennas – Microstrip Antennas for Medical Applications – Specific Absorption Rate – Remote Sensing Antenna	**9**
		Total: 45

REFERENCE BOOKS

1. Constantine A. Balanis, "*Modern Antenna Handbook",* John Wiley and Sons, New York, 2008.
2. Constantine A. Balanis, "*Antenna Theory - Analysis and Design"*, John Wiley & Sons, Inc., 2nd Edition, 2002.
3. Krauss.J. D., "*Antennas"*, 2nd Edition, John Wiley and Sons, New York, 1997.
4. I. J. Bahl and P. Bhartia, "*Microstrip Antennas"*, Artech House, Inc., 1980
5. W. L. Stutzman and G. A. Thiele, "*Antenna Theory and Design"*, 2nd Edition, John Wiley& Sons Inc., 1998.
6. Jim R. James, P. S. Hall, "*Handbook of Microstrip Antennas",* IEEE Electromagnetic wave series 28.

P15COS106	WIRELESS NETWORKS	L	T	P	C	Marks
		3	0	0	3	100

COURSE OUTCOMES

At the end of each unit, the students will be able to -

1. Illustrate the fundamental topics involved with wireless networking such as wireless LANs, wireless ATM and WIMAX.
2. Analyze the 3G and CDMA 2000 communication technology.
3. Analyze the routing protocols in wireless ad hoc and sensor networks.
4. Analyze the design considerations required for 3G networks.
5. Comprehend and describe 4G communication technology.

UNIT I	**WIRELESS LAN AND PANs** Fundamental of Wireless LANs – IEEE 802.11 WLANs – Physical Layer – MAC Sublayer – MAC Management Sublayer – Wireless ATM – HIPERLAN – HIPERLAN-2 – WiMAX.	**9**
UNIT II	**3G TECHNOLOGY** Migration Path to UMTS – UMTS Services – Air Interface – 3GPP Network Architecture – CDMA2000 Overview-Radio and Network Components – Network Structure – Radio Network – TD-CDMA – TD-SCDMA.	**9**
UNIT III	**AD HOC & SENSOR NETWORKS** Ad Hoc Network – Issues – Table-Driven Routing Protocols – DSDV – WRP – CGSR – On-Demand Routing Protocols – AODV – DSR – TORA – Hybrid Protocols – ZRP – ZHLS – Power Aware Routing Protocols – Wireless Sensor Networks – Issues and Challenges – Sensor Network Architecture – MAC Protocols for Sensor Networks.	**9**
UNIT IV	**NETWORK DESIGN CONSIDERATION** Traffic Forecasts – Build Ahead – Network Node Dimensioning – Placement of Network Nodes – Overall Network Topology – Service Treatments – TDM/IP/ATM Considerations – Communication Sites – Types – Installation – Towers – Stealth – In-Building and Tunnel System.	**9**
UNIT V	**INTRODUCTION TO 4G TECHNOLOGY** 4G Features and Challenges – Technology Path – IMS Architecture – Convergent Devices – 4G Technologies – Advanced Broadband Wireless Access and Services – Multimedia – MVNO – First Responders – Business Requirements.	**9**
		Total: 45

REFERENCE BOOKS

1.	C. Sivaram Murthy and B.S. Manoj, "*Ad Hoc Wireless Networks architectures and protocols"*, Pearson, 2013.
2.	Clint Smith. P.E., and Daniel Collins, "*3G Wireless Networks"*, 2nd Edition, Tata McGraw Hill, 2007.
3.	William Stallings, "*Wireless Communications and networks",* Pearson / Prentice Hall of India, 2nd Edition, 2007.
4.	Dharma Prakash Agrawal & Qing-An Zeng, "*Introduction to Wireless and Mobile Systems"*, Thomson India 2nd Edition, 2007.
5.	Gary. S. Rogers & John Edwards, "*An Introduction to Wireless Technology"*, Pearson Education, 2007.

P15COS107	COMMUNICATION SYSTEM LABORATORY – I	L	T	P	C	Marks
		0	0	4	2	100

COURSE OUTCOMES

At the end of each experiment, the students will be able to –

1. Practice to create the radiation pattern for various antennas.
2. Implement the adaptive filters, periodogram and multistage multirate system using DSP Processor
3. Design and simulate the turbo coding and QMF.
4. Simulate wireless channel equalizer design using DSP.
5. Evaluate the performance of digital data transmission through fiber optic link.

LIST OF EXPERIMENTS

1.	Design and simulate the modulation and coding in an AWGN communication channel using simulation packages.
2.	Implementation of adaptive filters, periodogram and multistage multirate system in DSP processor
3.	Design and simulate the QMF using simulation packages
4.	Antenna radiation pattern measurement of Yagi–Uda, dipole, End-Fire and Broad Side Array antennas.
5.	Radiation pattern measurement of micro strip antennas
6.	Performance evaluation of digital data transmission through fiber optic link.
7.	Implementation of video link using optical fiber.
8.	Design and performance analysis of error control encoder and decoder (CRC and Convolution Codes)
9.	Design and simulate the Turbo Coder.
10.	Wireless channel equalizer design using DSP (LMS and RLS)
11.	Implementation of linear and cyclic codes.
12.	Performance evaluation of simulated CDMA system

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S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	P15COS201	Wireless Communication Networks	4	0	0	4
2	P15COS202	RF System Design	3	0	0	3
3	P15COS203	Microwave Integrated Circuits	3	2	0	4
4	P15COS501	**Professional Elective -** Multimedia Compression Techniques	3	0	0	3
5	P15COS507	**Professional Elective -** Communication Network Security	3	0	0	3
6	P15COS518	**Professional Elective -** Advanced Digital Image Processing	3	0	0	3
Practical						
7	P15COS204	Communication Systems Laboratory - II	0	0	4	2
					Total Credits	**22**

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Copy to:-
HOD/ECE, Second Semester ME COS Students and Staff, COE

P15COS201	WIRELESS COMMUNICATION NETWORKS	L	T	P	C	Marks
		4	0	0	4	100

COURSE OUTCOMES

At the end of each unit, the students will be able to –

1. Discuss the concepts of wireless communication and the various propagation methods and channel models.
2. Analyze the various diversity techniques of wireless communication.
3. Explain the concept of MIMO communications.
4. Discuss the various multiple access techniques of wireless networks
5. Design of important techniques used in wireless networks.

UNIT I	**WIRELESS CHANNEL PROPAGATION AND MODEL** Propagation of EM Signals in Wireless Channel – Reflection – Diffraction and Scattering – Free-Space-Two-Ray Ground Reflection Model – Small Scale Fading – Channel Classification – Channel Models – COST-231 Hata Model – Longley–Rice Model – NLOS Multipath Fading Models – Rayleigh – Rician – Nakagami – Composite Fading – Shadowing Distributions – Link Power Budget Analysis.	**12**
UNIT II	**DIVERSITY** Capacity of Frequency Selective Fading Channels – Realization of Independent Fading Paths – Receiver Diversity – Selection Combining –Threshold Combining – Maximum–Ratio Combining – Equal Gain Combining – Transmitter Diversity – Channel Known at Transmitter – Channel Unknown at The Transmitter.	**12**
UNIT III	**MIMO COMMUNICATIONS** 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 – Special Multiplexing and BLAST Architectures.	**12**
UNIT IV	**MULTI USER SYSTEMS** Multiple Access – FDMA –TDMA – CDMA – SDMA – Hybrid Techniques – Random Access –ALOHA – SALOHA –CSMA – Scheduling – Power Control – Uplink Downlink Channel Capacity – Multiuser Diversity –MIMO–MU Systems.	**12**
UNIT V	**DESIGN OF WIRELESS NETWORKS** Cellular System Design – Frequency Reuse in Cellular Systems – Dynamic Resource Allocation in Cellular Systems – Area Spectral Efficiency – Interference Model – Power Control Impact on Interference – Ad-Hoc Wireless Networks – Link Design Issues – Medium Access Control Design Issues – Network Design Issues – Routing – Application Design Issues.	**12**
		Total: 60

REFERENCE BOOKS

1. Andrea Goldsmith, "*Wireless Communications"*, Cambridge University Press, 2007.
2. Rappaport. T.S., "*Wireless communications"*, Pearson Education, 2003

P15COS202	RF SYSTEM DESIGN	L	T	P	C	Marks
		3	0	0	3	100

COURSE OUTCOMES

At the end of each unit, the students will be able to –

1. State the importance of RF design and the behavior of various RF components
2. Describe the fundamentals of RF filter design and implementations.
3. State the various active RF components and its performance.
4. Analyze and design the RF amplifier.
5. Provide the designs of RF oscillators, mixers and its applications

UNIT I	**RF ISSUES** Importance of RF design – Electromagnetic Spectrum – RF Behaviour of Passive Components – Chip Components and Circuit Board Considerations – Scattering Parameters – Smith Chart and Applications.	**9**
UNIT II	**RF FILTER DESIGN** Overview – Basic Resonator and Filter Configuration – LPF – HPF – BPF – Bandstop Filters – Special Filter Realizations – Butterworth – Chebyshev – Filter Implementations – Unit Elements – Kuroda`S Identities – Coupled filter – Odd and Even Mode Excitation – Cascading Bandpass Filter Elements.	**9**
UNIT III	**ACTIVE RF COMPONENTS & APPLICATIONS** 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.	**9**
UNIT IV	**RF AMPLIFIER DESIGNS** Characteristics – Amplifier Power Relations – Stability Considerations – Constant Gain Circles – Constant VSWR Circles – Low Noise Circuits – Broadband – High Power and Multistage Amplifiers.	**9**
UNIT V	**OSCILLATORS, MIXERS & APPLICATIONS** Basic Oscillator Model – High Frequency Oscillator Configuration – Basic Characteristics of Mixers – Phase Locked Loops – RF Directional Couplers and Hybrid Couplers – Detector and Demodulator Circuits.	**9**
		Total: 45

REFERENCE BOOKS

1. Reinhold Ludwig and Powel Bretchko, "*RF Circuit Design – Theory and Applications"*, Pearson Education Asia, 1 st Edition, 2001
2. Joseph . J. Carr, "*Secrets of RF Circuit Design*," McGraw Hill Publishers, 3 rd Edition, 2000
3. Mathew M. Radmanesh, " *Radio Frequency & Microwave Electronics"*, Pearson Education Asia, 2 nd Edition, 2002

P15COS203	MICROWAVE INTEGRATED CIRCUITS	L	T	P	C	Marks
		3	2	0	4	100

COURSE OUTCOMES

At the end of each unit, the students will be able to –

1. Enhance the knowledge in the area of planar microwave circuits
2. Design the filter and matching networks.
3. Discuss the principles of amplifiers and oscillators.
4. Analyze the concepts of mixers and control circuits.
5. Express the measurement techniques in microwave design.

UNIT I	**INTRODUCTION TO MICROWAVE CIRCUITS** Definitions – Frequency Bands – Lumped Versus Distributed Circuits – Behavior of Finite Length Transmission Lines – General Characteristics of PC Boards – Transmission Lines on PC Boards – Passives Made from Transmission Lines – Resonators – Combiners – Splitters – Couplers.	**15**
UNIT II	**MATCHING NETWORKS AND FILTER DESIGN** Circuit Representation of Two Port RF/Microwave Networks – Low Frequency Parameters – High Frequency Parameters – Transmission Matrix – ZY Smith Chart – Design of Matching Circuits using Lumped Elements – Matching Network Design using Distributed Elements – Filter Design.	**15**
UNIT III	**AMPLIFIERS AND OSCILLATORS** Amplifiers – Stability Considerations in Active Networks – Gain Consideration in Amplifiers – Noise Consideration in Active Networks – Broadband Amplifier Design – Low Noise Amplifier Design – Oscillators – Oscillator versus Amplifier Design – Oscillation Conditions – Design and Stability Considerations of Microwave Transistor Oscillators.	**15**
UNIT IV	**MIXERS AND CONTROL CIRCUITS** Mixer Types – Conversion Loss – SSB and DSB Mixers – Design of Mixers – Single Ended Mixers – Single Balanced Mixers – Sub Harmonic Diode Mixers – Microwave Diodes – Phase Shifters – PIN Diode – Attenuators.	**15**
UNIT V	**MICROWAVE IC DESIGN AND MEASUREMENT TECHNIQUES** Microwave Integrated Circuits – MIC Materials – Hybrid versus Monolithic MICs – Multichip Module Technology – Fabrication Techniques – Miniaturization Techniques – Introduction to SOC – SOP – Test Fixture Measurements – Probe Station Measurements – Thermal and Cryogenic Measurements – Experimental Field Probing Techniques	**15**
		Total: 75

REFERENCE BOOKS

1.	Thomas H.Lee, "*Planar Microwave Engineering"*, Cambridge University Press, 2004.
2.	Matthew M. Radmanesh, "*Radio Frequency and Microwave Electronics"*, Pearson Education, 2 nd Edition 2002.
3.	Ulrich L. Rohde and David P.N., "*RF / Microwave Circuit Design for Wireless Applications"*, John Wiley, 2000.
4.	Ravender Goyal, "*Monolithic MIC; Technology & Design"*, Artech House, 1989.
5	Hoffman R.K., "*Handbook of Microwave Integrated Circuits"*, Artech House, Boston, 1987.

P15CO204	COMMUNICATION SYSTEMS LABORATORY – II	L	T	P	C	Marks
		0	0	4	2	100

COURSE OUTCOMES

At the end of each experiment, the students will be able to –

1. Design and simulate the S–parameters for micro strip directional couplers.
2. Design a micro strip antenna and obtain the characteristic parameter of it.
3. Analyse the characteristics of Transmission line.
4. Design and simulate RF amplifier and oscillator circuits.
5. Simulate MAC, Ad hoc routing protocols.

LIST OF EXPERIMENTS

1.	Design of Phase shifters, Directional couplers and Filters
2.	Simulation of RF Amplifier and RF Oscillator Circuits.
3.	OFDM transceiver design using MATLAB.
4.	Simulation of MIMO systems.
5.	S–parameter estimation of Microwave devices.
6.	Design and testing of a Microstrip coupler.
7.	Characteristics of $\lambda/4$ and $\lambda/2$ transmission lines.
8.	Simulation and performance evaluation of MAC protocols for wired and Wireless networks.
9.	Simulation and performance evaluation of Ad–hoc routing protocols using GLOMOSIM / NS2 (DSR, AODV, ZRP)
10.	Simulation and performance evaluation of Wireless Sensor Network technologies in terms of Throughput and Energy Efficiency.
11.	Simulation and performance evaluation of Wi–Fi LAN.
12.	Study of ZIGBEE /Bluetooth.

P15COS501	MULTIMEDIA COMPRESSION TECHNIQUES	L	T	P	C	Marks
		3	0	0	3	100

COURSE OUTCOMES

At the end of each unit, the students will be able to –

1. Overview about the concepts of multimedia, formats of sources (image, video & speech) and applications
2. Analyze the types of text compression and its techniques.
3. Describe the various audio compression technique and its performance comparisons
4. Analyze the various image compression technique and its performance comparisons
5. Analyze the various video compression technique and its performance comparisons

UNIT I	**INTRODUCTION** Special Features of Multimedia – Graphics and Image Data Representations – Fundamental Concepts in Video and Digital Audio – Storage Requirements for Multimedia Applications – Need for Compression – Taxonomy of Compression Techniques – Overview of Source Coding-Source Models – Scalar and Vector Quantization Theory – Evaluation Techniques – Error Analysis and Methodologies.	**9**
UNIT II	**TEXT COMPRESSION** Compaction Techniques – Huffmann Coding – Adaptive Huffmann Coding – Arithmetic Coding – Dictionary Techniques – LZW Family Algorithms – LZW Encoding – LZW Decoding.	**9**
UNIT III	**AUDIO COMPRESSION** Audio Compression Techniques – M -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 – Silence Compression – Speech Compression Techniques – Formant and CELP Vocoders.	**9**
UNIT IV	**IMAGE COMPRESSION** 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 – JPEG 2000 Standards.	**9**
UNIT V	**VIDEO COMPRESSION** 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.	**9**
		Total: 45

REFERENCE BOOKS

1. Khalid Sayood, "*Introduction to Data Compression"*, Morgan Kauffman Harcourt India, 2nd Edition, 2012
2. Mark S. Drew, Ze–Nian Li , "*Fundamentals of Multimedia"*, PHI, 1st Edition, 2004
3. David Salomon, "*Data Compression – The Complete Reference"*, Springer Verlag New York Inc.,2nd Edition, 2001
4. Mark Nelson, "*Data compression"*, BPB Publishers, New Delhi,1998
5. Watkinson,J, "*Compression in Video and Audio"*, Focal press,London.1995

P15COS507	COMMUNICATION NETWORK SECURITY	L	T	P	C	Marks
		3	0	0	3	100

COURSE OUTCOMES

At the end of each unit, the students will be able to –

1. Describe symmetric ciphers techniques and standards and design principles.
2. Discuss advanced encryption standards
3. Explain public key encryption, functions, algorithms, standards.
4. Describe authentication application, web security.
5. Express the malicious software and firewall design

UNIT I	**SYMMETRIC CIPHERS** 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 – Block Cipher Modes of Operation – Stenography.	**9**
UNIT II	**ADVANCED ENCRYPTION STANDARD AND STREAM CIPHERS** 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.	**9**
UNIT III	**PUBLIC-KEY ENCRYPTION AND HASH FUNCTIONS** 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.	**9**
UNIT IV	**NETWORK SECURITY PRACTICE** 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.	**9**
UNIT V	**SYSTEM SECURITY** Intruders- Intruder Detection – Password Management – Malicious Software – Virus and Related Threats – Virus Counter Measures – Firewalls – Firewall Design Principles – Trusted Systems.	**9**
		Total: 45

REFERENCE BOOKS

1. William Stallings, *"Cryptography and Network Security"*, 3rd Edition. Prentice Hall Of India, New Delhi ,2004
2. Charlie Kaufman, "*Network Security: Private Communication in Public World*", 2nd Edition. Prentice Hall Of India, New Delhi ,2004

P15COS518	ADVANCED DIGITAL IMAGE PROCESSING	L	T	P	C	Marks
		3	0	0	3	100

COURSE OUTCOMES

At the end of each unit, the students will be able to –

1. Explain the image fundamentals and mathematical transforms necessary for image processing and to study the image enhancement techniques
2. Discuss the image segmentation and representation techniques
3. Describe how image are analyzed to extract features of interest.
4. Analyze the concepts of image registration and image fusion
5. Examine the constraints in image processing when dealing with 3D data sets

UNIT I	**FUNDAMENTALS OF DIGITAL IMAGE PROCESSING** Elements of Visual Perception – Brightness – Contrast – Hue – Saturation – Mach Band Effect – 2D Image Transforms – DFT, DCT, KLT and SVD. Image Enhancement in Spatial and Frequency Domain – Review of Morphological Image Processing.	**9**
UNIT II	**SEGMENTATION** Edge Detection – Thresholding – Region Growing – Fuzzy Clustering – Watershed Algorithm – Active Contour Methods – Texture Feature Based Segmentation – Model Based Segmentation – Atlas Based Segmentation – Wavelet Based Segmentation Methods.	**9**
UNIT III	**FEATURE EXTRACTION** First and Second Order Edge Detection Operators – Phase Congruency – Localized Feature Extraction Detecting Image Curvature – Shape Features Hough Transform – Shape Skeletonization – Boundary Descriptors – Moments – Texture Descriptors – Autocorrelation – Co-occurrence Features – Run Length Features – Fractal Model Based Features – Gabor Filter – Wavelet Features.	**9**
UNIT IV	**REGISTRATION AND IMAGE FUSION** Registration– Pre-Processing – Feature Selection–Points – Lines – Regions and Templates – Feature Correspondence–Point Pattern Matching – Line Matching – Region Matching – Template Matching – Transformation Functions– Similarity Transformation and Affine Transformation – Re-sampling – Nearest Neighbour and Cubic Splines – Image Fusion – Overview of Image Fusion – Pixel Fusion – Multi resolution Based Fusion Discrete Wavelet Transform – Curvelet Transform – Region Based Fusion.	**9**
UNIT V	**3D IMAGE VISUALIZATION** Sources of 3D Data Sets – Slicing the Data Set – Arbitrary Section Planes – The Use of Color – Volumetric Display – Stereo Viewing – Ray Tracing – Reflection – Surfaces – Multiply Connected Surfaces – Image Processing in 3D – Measurements on 3D Images.	**9**
		Total: 45

REFERENCE BOOKS

1. John C.Russ, "*The Image Processing Handbook",* CRC Press, 2007.
2. Mark Nixon, Alberto Aguado, "*Feature Extraction and Image Processing",* Academic Press, 2008.
3. Ardeshir Goshtasby , *"2D and 3D Image Registration for Medical, Remote Sensing and Industrial Applications",* John Wiley And Sons, 2005.
4. Anil K. Jain, "*Fundamentals of Digital Image Processing"*, Pearson Education, Inc., 2002.
5. Rafael C. Gonzalez, Richard E. Woods, "*Digital Image Processing"*, Pearson, Education, Inc., Second Edition, 2004.
6. Rick S. Blum, Zheng Liu, "*Multisensor Image Fusion and its Applications"*, Taylor & Francis, 2006.

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME III Semester under Regulations 2015
Electronics and Communication Engineering
Branch: M.E. Communication Systems

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	P15COS514	**Professional Elective**- Advanced Fiber Optic Technologies	3	0	0	3
2	P15COS516	**Professional Elective**- Wireless Sensor Networks	3	0	0	3
3	P15COS607	**Open Elective**- Human Resource Development	3	0	0	3
Practical						
4	P15COS301	Project Phase - I	0	0	16	8
					Total Credits	**17**

Approved by

Chairman, Electronics and Communication Engineering BOS
Dr.R.S.Sabeenian

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council &Principal
Dr.S.R.R.Senthil Kumar

Copy to:-
HOD/ECE, Third Semester ME COS Students and Staff, COE

P14COS514	ADVANCED FIBER OPTIC TECHNOLOGIES	L	T	P	C	Marks
		3	0	0	3	100

COURSE OUTCOMES

At the end of each unit– the students will be able to –

1. Describe the Basic Principles of Operation of Optical System Component and Network Design.
2. Examine the Principles of Coherent System.
3. Analyze the Architecture of Optical Network.
4. Discuss the Concepts of TDM and SOLITON.
5. Interpret the Concept of Optical CDMA.

UNIT I **Optical System Components And Network Design** **9**

Optical System Components – MZIM Multiplexers – Filters – Switches; Wavelength Converters – Optical Amplifiers – EDFA – Raman Amplifiers and Hybrid – Transmission System Engineering – System Model – Aimer Penalty – Transmitter – Receiver – Cross Talk – Dispersion Compensation – Wavelength Stabilization – FWM.

UNIT II **Coherent Systems** **9**

Basic Principles of Coherent Detections – Practical Constraints – Injection Laser Line Width State of Polarization – Local Oscillator Power – Fiber Limitations – Modulation Formats – ASK – FSK – PSK – DPSK and Polarization Shift Keying (POL SK) – Demodulation Schemes – Homodyne – Heterodyne – Synchronous and Non Synchronous Detection; Comparison – Carrier Recovery in Coherent Detection.

UNIT III **Optical Network Architectures** **9**

Introduction – First Generation Optical Networks – SONET / SDH Network – Second Generation (WDM) Optical Networks – Broad Cast and Select Wavelength Routing Architectures – Media – Access Control Protocols

UNIT IV **Optical TDM AND SOLITON** **9**

Optical Time division Multiplexing – Interleaving – Packet Interleaving – Multiplexer and Demultiplexers – AND Gates – Non Linear Optical Loop Mirror – Soliton – Trapping AND Gate – Synchronization.

UNIT V **Optical CDMA** **9**

Prime Codes and its Properties – Generalized and Extended Prime Codes – Experimental Demonstration of Optical CDMA – Synchronization of Optical CDMA Networks – Multi-wavelength Optical CDMA Networks.

Total: 45

REFERENCE BOOKS

1. Max Ming–Kang Liu, "*Principles and Applications of Optical Communication*", Tata McGraw Hill Education Pvt., Ltd., New Delhi.
2. Le Ngyyen Binh , "*Digital Optical Communications*", CRC Press – Taylor and Francis Group – Indian reprint 2012.
3. Rajiv Ramaswami and Kumar N. Sivarajan, "*Optical Networks: A Practical Perspective*", Harcourt Asia Pte Ltd., Second Edition 2006.
4. P.E. Green, Jr., "*Fiber Optic Networks*", Prentice Hall, NJ, 1993.
5. Guu–Chang Yang, "*Prime Codes with Application to Optical and Wireless Networks*", Artech House, Inc., 2002.

P15COS516	WIRELESS SENSOR NETWORKS	L	T	P	C
		3	0	0	3

COURSE OUTCOMES

At the end of each unit– the students will be able to –

1. Describe the overview of wireless sensor networks.
2. Design the architectures of sensor network.
3. Analyze the concepts of MAC and routing protocols.
4. Discuss the infrastructure establishment.
5. Examine the need of security and data management in WSN.

UNIT I **OVERVIEW OF WIRELESS SENSOR NETWORKS** **9**

Challenges for Wireless Sensor Networks – Characteristics Requirements – Required Mechanisms – Difference Between Mobile Ad–Hoc and Sensor Networks – Applications of Sensor Networks – Case Study – Enabling Technologies for Wireless Sensor Networks.

UNIT II **ARCHITECTURES** **9**

Single – Node Architecture Hardware Components – Energy Consumption of Sensor Nodes Operating Systems and Execution Environments – Network Architecture – Sensor Network Scenarios – Optimization Goals and Figures of Merit – Gateway Concepts – Physical Layer and Transceiver Design Considerations .

UNIT III **MAC AND ROUTING** **9**

Mac Protocols for Wireless Sensor Networks – IEEE 802.15.4 – Zigbee – Low Duty Cycle Protocols and Wakeup Concepts – S-Mac – The Mediation Device Protocol – Wakeup Radio Concepts – Address and Name Management – Assignment of Mac Addresses – Routing Protocols – Energy–Efficient Routing – Geographic Routing.

UNIT IV **INFRASTRUCTURE ESTABLISHMENT** **9**

Topology Control – Clustering – Time Synchronization – Localization and Positioning – Sensor Tasking and Control.

UNIT V **DATA MANAGEMENT AND SECURITY** **9**

Data Management in WSN – Storage and Indexing in Sensor Networks – Query Processing in Sensor – Data Aggregation – Directed Diffusion – Tiny Aggregation – Greedy Aggregation – Security in WSN.

Total: 45

REFERENCE BOOKS

1. Ian F. Akyildiz, Mehmet Can Vuran, " *Wireless Sensor Networks*", John Wiley, 2010
2. Yingshu Li, My T. Thai,Weili Wu, "*Wireless Sensor Networks and Applications*" , Springer 2008
3. Holger Karl & Andreas Willig, "*Protocols and Architectures for Wireless Sensor Networks*" , John Wiley, 2005
4. Feng Zhao & Leonidas J. Guibas, "*Wireless Sensor Networks– An Information Processing Approach*", Elsevier, 2007.
5. Kazem Sohraby, Daniel Minoli, & Taieb Znati, "*Wireless Sensor Networks–Technology, Protocols and Applications*", John Wiley, 2007.

SEMESTER - III

P15COS607 HUMAN RESOURCE DEVELOPMENT L:T:P:C 3:0:0:3

Course Outcomes : The Student will be able to:

1. Study the overview of Human Resource Development.
2. Understand the designing of HRD systems and developing HRD Strategies.
3. Study the methods of training and development for the employees.
4. Design performance appraisal system for managers.
5. Link HRD with the strategic plan of the organization

Unit	Syllabus Contents	Number of Sessions
1	**INTRODUCTION TO HRD** Nature and concept of HRD – Improving performance through HRD- Recent scenario of HRD in India- HRM and HRD – Role and Competencies of HRD manager- Challenges of HRD	9
2	**DESIGNING HRD SYSTEMS AND DEVELOPING HRD STRATEGIES** Subsystems of HRD - Designing HRD Strategy- HRD Strategy model- Future challenges to HRD Strategy.	9
3	**TRAINING AND DEVELOPMENT** Learning Cycle-Learning Process- objectives of training –Training need analysis-Training methods- Evaluation of Training - Designing management development Programs – Leadership development – Assessment and development center	9
4	**PERFORMANCE APPRAISAL AND POTENTIAL APPRAISAL** Designing Performance Appraisal System- Performance Appraisal Process-Methods of Performance Appraisal- Potential Appraisal-Matching Career Needs of Organization and Individual- Competency mapping - Career Planning Process-Employee Coaching – Process of Employee Counseling –Types of Mentoring	9
5	**QUALITY OF WORK LIFE AND STRATEGIC HRD** Empowering Employees- Need for Quality of work life- HRD Audit and Human Resource Accounting- HRD Culture – Linkage of Organizational Strategy to HRD Tactics- HRD and Organizational Change.	9
	Total No of Sessions	**45**

Learning Resources:

1	Text Books	1. Tapomoy Deb, Human Resource Development, Ane Books,2006 2. Mankin, D., *Human resource development,* Oxford University Press India,2015 3. Udai pareek., Designing & Managing Human resources sytems,2015
2	Reference Books	1. Haldar, U. K., *Human resource development,* Oxford University Press India,2015 2. Rao, T.V., Future of HRD, Macmillan Publishers India,2015 3. Nadler, L., Corporate human resources development, Van Nostrand Reinhold,2015 4. Cooper, Managing Stress, Sage, 2011
3	Web sites / links	1. http://forum.hrdiscussion.com/ 2. http://network.hrmtoday.com/forum 3. http://www.citeman.com/11853-evolution-of-the-concept-of-hrm/ 4. www.citehr.com 5. www.shrm.org

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME IV Semester under Regulations 2015
Electronics and Communication Engineering
Branch: M.E. Communication Systems

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Practical						
1	P15COS401	Project Phase – II	0	0	24	12
					Total Credits	**12**

Approved by

Chairman, Electronics and Communication Engineering BOS
Dr.R.S.Sabeenian

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council &Principal
Dr.S.R.R.Senthil Kumar

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