Syllabi & Scheme

for

M.Tech Course

In

COMMUNICATION ENGINEERING

(Electronics and Communication Engineering)

of

KERALA TECHNOLOGICAL UNIVERSITY

(With Effect from the Academic Year 2015 onwards)

SEMESTER 1 (CREDITS 23)										
Sl No	**Course Code**	**Name of the Subject**	**Hours / Week**			**Internal Marks**	**End Semester Exam**		**TOTEL**	**Credits**
			L	**T**	**P**		**Marks**	**Dur(h)**		
1.	09EC6211	Advanced Engineering Mathematics	4	0	0	40	60	3	100	4
2.	09EC6221	Advanced digital signal processing	4	0	0	40	60	3	100	4
3.	09EC6231	Advanced Digital Communication System	4	0	0	40	60	3	100	4
4.	09EC6241	Advanced Mobile Communication Systems and standards	3	0	0	40	60	3	100	3
5.	09EC62X5	Elective 1	3	0	0	40	60	3	100	3
6.	09EC6251	Research Methodology	0	2	0	100	0	0	100	2
7.	09EC6261	Seminar				100	0	0	100	2
8.	09EC6271	Advanced Signal Processing Laboratory	0	0	2	100	0	0	100	1
		Total	**18**	**2**	**2**	**500**	**300**		**800**	**23**
	09EC62X5	**Elective I**					-			
1.	09EC6215	Advanced Data Communication System								
2.	09EC6225	Communication Network Security								
3.	09EC6235	Speech Processing And Synthesis								
4.	09EC6245	Wavelet Transforms and Applications								

SEMESTER 2 (CREDITS 19)										
Sl No	**Course Code**	**Name of the Subject**	**Hours / Week**			**Internal Marks**	**End Semester Exam**		**marks**	**Credits**
			L	**T**	**P**		**Marks**	**Dur (h)**		
1.	**09EC6212**	Advanced Microwave Communication Systems	4	0	0	40	60	3	100	4
2.	**09EC6222**	Advanced Optical Communication Systems	3	0	0	40	60	3	100	3
3.	**09EC6232**	Advanced Satellite Based Systems	3	0	0	40	60	3	100	3
4.	**09EC62Y6**	**Elective – II**	3	0	0	40	60	3	100	3
5.	**09EC62Z6**	**Elective – III**	3	0	0	40	60	3	100	3
6.	**09EC6262**	Mini Project	0	0	4	100	0	0	100	2
7.	**09EC6272**	Advanced Communication System design Laboratory	0	0	2	100	0	0	100	1
		Total	**16**	**0**	**6**	**400**	**300**		**700**	**19**
	09EC62Y6	**Elective II**								
1	**09EC6216**	Communication Switching and Multiplexing								
2	**09EC6226**	Multimedia Compression Techniques								
3	**09EC6236**	Network Routing Algorithms								
4	**09EC6246**	Cloud Computing								
	09EC62Z8	**Elective III**								
1	**09EC6266**	Advanced Digital Image Processing								
2	**09EC6276**	Antenna Theory and Design								
3	**09EC6286**	Neural Network and Applications								
4	**09EC6296**	Grid Computing								

SEMESTER 3 (CREDITS 14)										
Sl No	**Course Code**	**Name of the Subject**	**Hours / Week**			**Internal Marks**	**End Semester Exam**		**Total marks**	**Credits**
			L	**T**	**P**		**Marks**	**Dur (h)**		
	09EC72U7	Elective IV	3	0	0	40	60	3	100	3
	09EC72V7	Elective V	3	0	0	40	60	3	100	3
	09EC7263	Seminar	0	0	2	100	0	0	100	2
	09EC7283	Master Research Project Phase I	0	0	12	50	0	0	50	6
		Total	**6**	**0**	**14**	**230**	**120**		**350**	**14**
	09EC72U7	**Elective IV**								
1	**09EC72**17	Coding Techniques for Spread Spectrum Communications								
2	**09EC72**27	High Speed Communication Networks								
3	**09EC72**37	Internetworking Multimedia								
4	**09EC72**47	Markov Modelling And Queuing Theory								
	09EC72V7	Elective V								
1	**09EC72**67	Multicasting Techniques in MANETS								
2	**09EC72**77	Radar Signal Processing								
3	**09EC72**87	VLSI for Wireless Communication								
4	**09EC72**97	Wireless Sensor Networks								

SEMESTER 4 (CREDITS 12)										
Sl No	**Course Code**	**Name of the Subject**	**Hours / Week**			**Internal Marks**	**End Semester Exam**		**Total marks**	**Credits**
			L	**T**	**P**		**Marks**	**Dur (h)**		
	09EC7284	Master Research Project Phase II	0	0	21	100	0	0	100	12
		Total	**0**	**0**	**21**	**100**	**0**	**0**	**100**	**12**
		Grand Total				**1230**	**720**		**1950**	**68**

Note: L – Lecture, T- Tutorial, P – Practical

Examination Pattern

1. Theory Subjects

The examination pattern for all theory subjects is as given below.

Internal Continuous Assessment: 40 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

Test 1- 15 marks

Test 2- 15 marks

Assignment/Tutorial-10 marks

Total-40marks

End Semester Examination: 60 marks

2. Laboratory Subjects

The details of the internal assessment for each laboratory subject are as given below.

Mid Term Internal Test	40 Marks
Laboratory Experiments & Viva Voce	10 Marks
Final Internal Test	50 Marks
Total	**100 Marks**

SEMESTER – I

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC6211	ADVANCED ENGINEERING MATHEMATICS	4-0-0-4	2015

Course Objectives

To provide in-depth treatment on methods and techniques in

- *Linear Equations , Matrix Algebra and Vector Spaces,*
- *The Laplace Transform, The Fourier Transform and Z Transform,*
- *Digital Arithmetic, Multidimensional Transforms and Wavelet Transform*

Syllabus

Linear Equations and Matrix Algebra, Transforms and Digital Representations, Multidimensional Transforms and Wavelet Transforms

Expected Outcome

The students would be able to

- Familiarize with the linear equations
- Understand about the transforms and its properties
- Easily tackle with the digital arithmetic

Course Plan

Module	Contents	Hours	Sem Exam Marks (%)
Module 1	**Linear Equations and Matrix Algebra:**Fields; system of linear equations, and its solution sets; elementary row operations and echelon forms; matrix operations; invertible matrices, LU-factorization. **Vector Spaces:**Vector spaces; subspaces; bases ; dimension; coordinates	**14**	**25**
Module 2	**Transforms** Linear Time Invariant Systems, The Laplace Transform, Properties, The Fourier Transform, Properties of Fourier Transform, Fourier Transform of Sequence(Fourier Series) and its properties, Fourier Analysis forContinuous and Discrete Time Signals. Z Transform and its properties.	**7**	**13**
	FIRST INTERNAL TEST		
Module 2	Digital Arithmetic: Fixed and Floating point representation, IEEE 754 Floating point standards, Floating point arithmetic operations	**7**	**12**
Module3	**Multidimensional Transforms** Introduction, 2D orthogonal & unitary transforms, Properties of unitary transforms, 1D and 2D- DFT, DCT, Walsh, Hadamard Transform, Haar Transform, Slant Transform, KLT, SVD Transform	**14**	**25**
	SECOND INTERNAL TEST		

Module 4	**Wavelet Transform** Introduction, C-T wavelets, properties, inverse CWT. Discrete wavelet transform and orthogonal wavelet decomposition using Harr Wavelets.	**14**	**25**
	END SEMESTER EXAM		
	Total Hours	**56**	

TEXT BOOKS:

1. **"**Linear Algebra and its Applications**"**, David C. Lay, 3rd edition, Pearson Education(Asia) Pte. Ltd, 2005
2. Digital Arithmetic, Milos D. Ercegovac, Tomas Lang, Elsevier
3. "Fundamentals of Digital Image Processing", Anil K. Jain, PHI, New Delhi
4. Digital Signal Processing: a practical approach, Emmanuel C Ifeachor, W Barrie Jervis, Pearson Education (Singapore) Pte. Ltd., Delhi
5. Wavelet transforms-Introduction to theory and applications, RaghuveerM.Rao and Ajit S. Bapardikar, Person Education

REFERENCE BOOKS:

1. Schaum's Outline for Advanced Engineering Mathematics for Engineers and Scientists , Murray R. Spiegel, MGH Book Co., New York
2. Advanced Engineering Mathematics, Erwin Kreyszing, John Wiley & Sons, NEW YORK
3. Advanced Engineering Mathematics, JAIN, R K,IYENGAR, S R K, Narosa, NEW YORK
4. Signal processing with fractals: a Wavelet - based approach, Wornell, Gregory, PH, PTR, NEW JERSEY
5. Wavelet a primer, Christian Blatter, Universities press (India) limited, Hyderabad

Internal Continuous Assessment: 40 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC6221	ADVANCED DIGITAL SIGNAL PROCESSING	4-0-0-4	2015

OBJECTIVES:

To provide in-depth treatment on methods and techniques in

- *Discrete-time signal transforms, digital filter design, optimal filtering*
- *Power spectrum estimation, multi-rate digital signal processing*
- *.Adaptive filter design, multi rate signal processing*

Syllabus

Discrete Random Signal Processing, SpectrumEstimation, Adaptive Filters, Multirate DigitalSignal Processing

EXPECTED OUTCOME

The students would be able to

- Practice with the discrete time signal transforms
- Understand the filter designs
- Manage with the processing and filtering methods

Course Plan

Module	Contents	Hours	Sem Exam Marks (%)
Module 1	**DISCRETE RANDOMSIGNALPROCESSING:** Weiner Khitchine relation - Power spectral density – filtering random process, Spectral Factorization Theorem, special types of random process – Signal modeling-Least Squares method, Pade approximation, Prony's method, iterative Pre filtering, Finite Data records, Stochastic Models.	**14**	**25**
Module 2	**SPECTRUMESTIMATION;**Non-Parametric methods-Correlation method -Co-variance estimator-Performance analysis of estimators –Unbiased consistent estimators-	**7**	**13**
	FIRST INTERNAL TEST		
Module 2	Periodogram estimator -Barlett spectrum estimation,- Welch estimation-Model based approach-AR,MA,ARMA Signal modeling-Parameter estimation using Yule-Walker method	**7**	**12**
Module3	**ADAPTIVE FILTERS:**FIR Adaptive filters-Newton's steepest descent method - Adaptive filters based on steepest descent method- Widrow Hoff LMS Adaptive algorithm-Adaptive channel equalization-Adaptive echo canceller-Adaptive noise cancellation-RLS Adaptive filters-Exponentially weighted RLS – Sliding window RLS –Simplified IIR LMS Adaptive filter	**14**	**25**
	SECOND INTERNAL TEST		
Module 4	**MULTIRATE DIGITALSIGNAL PROCESSING:** Mathematical description of	**14**	**25**

	change of sampling rate-Interpolation and Decimation-Continuous time model-Direct digital domain approach-Decimation by integer factor- Interpolation by an integer factor-Single and multistage realization-Poly phase realization -Applications to sub band coding -Wavelet transform and filter bank implementation of wavelet expansion of signals.		
	END SEMESTER EXAM		
	Total Hours	**56**	

REFERENCES:

1. MonsonH.Hayes, "Statistical Digital Signal Processing and Modeling",JohnWileyandSons Inc., New York, 2006.
2. Sophoncles J. Orfanidis,"Optimum Signal Processing ", McGraw-Hill,2000.
3. John G.Proakis,Dimitris G.Manolakis,"Digital Signal Processing",PrenticeHallofIndia,New Delhi,2005.
4. Simon Haykin, "Adaptive Filter Theory", Prentice Hall, Englehood Cliffs, NJ1986.
5.S.Kay,"Modern spectrum Estimation theory and application", Prentice Hall, Englehood Cliffs, NJ1988.
6. P.P.Vaidyanathan, "Multirate Systems and FilterBanks", PrenticeHall,1992

Internal Continuous Assessment: 40 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC6231	ADVANCED DIGITAL COMMUNICATION SYSTEM	4-0-0-4	2015

OBJECTIVES:

To provide in-depth treatment on methods and techniques in

- *Representation of signals and spectra*
- *Formatting, baseband and M-arymodulation/demodulation*
- *Synchronization*

SYLLABUS

Signals and Spectra , Formatting and Baseband Transmission, Bandpass - Modulation/ Demodulation and Synchronization

EXPECTED OUTCOME

The students would be able to

- Understand about the signals and representations
- Easily deal with different modulation schemes
- Familiarize with the practical difficulties

Course Plan

Module	Contents	Hours	Sem Exam Marks (%)
Module 1	**SIGNALS AND SPECTRA** Digital communication signal processing – Classification of signals – Spectral density – Correlation and Covariance – Signal transmission through linear systems – Bandwidth of digital data – Nyquist minimum bandwidth – Shannon's Capacity theorem.	**14**	**25**
Module 2	**FORMATTING AND BASEBAND TRANSMISSION** Formatting textual data and analog information – Uniform and non-uniform quantization – Baseband transmission –	**7**	**13**
	FIRST INTERNAL TEST		
Module 2	Pulse coded modulation – Multilevel baseband transmission – Intersymbol interference – Partial response signaling	**7**	**12**
Module3	**BANDPASS - MODULATION/DEMODULATION** Digital bandpass modulation/demodulation - M-ary signaling and modulation - Detection of signals in Gaussian noise – Coherent detection – Non-coherent detection – Error performance of binary systems – Symbol error performance for M-ary signaling.	**14**	**25**

	SECOND INTERNAL TEST		
Module 4	**SYNCHRONIZATION** Synchronization in the context of digital communications – Signal parameter estimation – Carrier phase estimation – Symbol timing estimation – Joint estimation of carrier phase and symbol timing – Frame synchronization – Network synchronization.	**14**	**25**
	END SEMESTER EXAM		
	Total Hours	**56**	

TEXT BOOKS:

1. Bernard Sklar, "*Digital Communications – Fundamentals and Applications*", 2nd Edition, Pearson Education, 2001.

2. Proakis, J. G, M. Salehi, "*Digital Communications*", 5th Edition, McGraw Hill Inc., NY,2008.

3. Haykins. S, "*Digital Communications*", John Wiley & Sons Inc., NJ, 1998.

Internal Continuous Assessment: 40 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC6241	ADVANCED MOBILE COMMUNICATION SYSTEMS AND STANDARDS	3-0-0-3	2015

OBJECTIVES:

To provide in-depth treatment on methods and techniques in

- *The fundamental concepts in cellular technology, standards evolved, models of mobile radio channels, communication technologies adapted and wireless networks*
- *The most recent technological developments in Mobile communication systems.*

Syllabus

Introduction to Mobile Communication Systems, Cellular Concept ,

Mobile Radio Propagation,GSM, GPRS and 3G Standards\

EXPECTED OUTCOME

The students would be able to

- Familiarize with the fundamental concepts of cellular technology
- Understand about the recent technological advancements

Course Plan

Module	Contents	Hours	Sem Exam Marks (%)
Module 1	**INTRODUCTION TO MOBILE COMMUNICATION SYSTEMS** Evolution of Mobile radio communications – Mobile radio systems in the U.S. and around the world – Examples of Mobile radio systems.	**10**	**25**
Module 2	**CELLULAR CONCEPT** Cellular concept – Frequency reuse – Channel Assignment strategies – Handoff strategies Interference and System capacity –	**6**	**13**
	FIRST INTERNAL TEST		
Module 2	Trunking and Grade of service – Improving capacity in cellular systems.	**6**	**12**
Module3	**MOBILE RADIO PROPAGATION** Small-scale multipath propagation – Impulse response of a multipath channel – Parameters of mobile multipath channel – Types of small-scale fading – Rayleigh and Rician distributions – Statistical models for multipath fading channels.	**10**	**25**

	SECOND INTERNAL TEST		
Module 4	**GSM, GPRS, 3G STANDARDS** GSM services and features – GSM system architecture – GSM radio subsystem – Frame structure for GSM – Signal processing in GSM – GPRS network architecture – GPRS services and features – 3G UMTS network architecture – UMTS services and features.	**10**	**25**
	END SEMESTER EXAM		
	Total Hours	**42**	

TEXT BOOKS:

1. Rappaport, T.S., "*Wireless Communications, Principles and Practice*", 2nd Edition, PrenticeHall, NJ, 2002.

2. William Stallings, "*Wireless Communications and Networks*", 2nd Edition, PearsonEducation, 2005.

3. Siegmund M. Redl, Mathias K. Weber, Malcolm W. Oliphant, "*An Introduction to GSM*",Artech House Publishers,1998

Internal Continuous Assessment: 40 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC6215	ADVANCED DATA COMMUNICATION SYSTEM	3-0-0-3	2015

OBJECTIVES:

To provide in-depth treatment on methods and techniques in the area of data communications and computer network aspects that are required for understanding of protocols used in wireless communications

Syllabus

Introduction to Network models,WAN Standards,User Datagram Protocol ,Cryptography

EXPECTED OUTCOME

The students would be able to

- Understand about the computer networks and its importance in communication
- Familiarize with the protocols on communication

Course Plan

Module	Contents	Hours	Sem Exam Marks (%)
Module 1	**Introduction to Network models:** ISO – OSI, SNA, and AppleTalk and TCP/IP models. LAN Standards: Ethernet (IEEE 802.3), Over View of Token ring and Token Bus, Wireless LAN standard(IEEE 802.11 b/a/g)	**10**	**25**
Module 2	**WANStandards:** X.25, Frame Relay, and ATMClassfull and Classless IP Addresses,	**6**	**13**
	FIRST INTERNAL TEST		
Module 2	ARP and RARP, IPv4, and IPv6, RIP, OSPF and BGP	**6**	**12**
Module3	User Datagram Protocol (UDP), Transmission Control Protocol (TCP) and Stream Controlled Transmission Protocol(SCTP) Overviewof WWW, DNS, e-mail, SNMP, RMON	**10**	**25**
	SECOND INTERNAL TEST		
Module 4	Cryptography, Firewalls, Secure Socket Layer(SSL),Security at different layers in application Layer Protocols, and Virtual Private Networks(VPN)	**10**	**25**

	END SEMESTER EXAM		
	Total Hours	**42**	

TEXT BOOKS:

1.BehrouzA.Forouzan,“TCP/IPProtocolSuit”,TMH,2000

2.WayneTomasi,“IntroductiontoDatacommunicationsandNetworking”,PearsonEd.20073.TananbaumA.

S.,“ComputerNetworks”,3Ed.,PHI,1999

4.BlackU,“ComputerNetworks-Protocols,StandardsandInterfaces”,PHI,19965.StallingsW.,

“DataandComputerCommunications”,6Ed.,PHI,2002.

6.StallingsW.,“SNMP,SNMPv2,SNMPv3,RMON1&2”,3Ed.,AddisonWesley,1999**7.**LaurraChappell(Ed),

“Introduction to Cisco Router Configuration”,Techmedia

Internal Continuous Assessment: 40 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC6225	COMMUNICATION NETWORK SECURITY	3-0-0-3	2015

OBJECTIVES

- *To study various aspects of Network Security Attacks, Services and Mechanisms.*
- *To deal with various Encryption, Authentication and Digital Signature Algorithms*
- *To deal with different general purpose and application of specific security protocols and techniques.*

Syllabus

Data Encryption Standard,Public Key Encryption and Hash Functions,Network Security Practice and Wireless Network Security

EXPECTED OUTCOME

The students would be able to

- Understand about the computer networks and its importance in communication
- Familiarize with the protocols on communication

Course Plan

Module	Contents	Hours	Sem Exam Marks (%)
Module 1	**DATA ENCRYPTION STANDARD:**Services – Mechanisms and Attacks – OSI security Architecture – Model for Network Security – Classical Encryption Techniques – Symmetric Cipher Model – Substitution Techniques – Transposition Techniques – Rotor Machines– Stenography – Block Ciphers and Data Encryption Standard – Simplified DES – Block Cipher Principles, Data Encryption Standard – Strength of DES – Differential and Linear Crypt Analysis, Block Cipher Design Principles – Block Cipher Modes of Operation.	**10**	**25**
Module 2	**PUBLIC KEY ENCRYPTION AND HASH FUNCTIONS:**Public Key Cryptography and RSA – Principles of Public Key Cryptosystems – RSA Algorithm – Key Management and other public key cryptosystems – Key Management– Diffie–Hellman Key Exchange – Elliptic Curve Arithmetic – Elliptic Curve Cryptography – Message Authentication and Hash Functions –	**6**	**13**
	FIRST INTERNAL TEST		
Module 2	Authentication Requirements – Authentication Functions – Message Authentication Codes – Hash Functions and MACs; Hash Algorithms – MD5 Message Digest Algorithm, Secure Hash Algorithm RIPEMD 160, HMAC– Digital Signatures and Authentication Protocols – Digital Signature Standards	**6**	**12**
Module3	**NETWORK SECURITY PRACTICE:**Authentication Applications – Kerberos – X.509 Authentication Service– Electronic Mail Security – Pretty Good Privacy – S/MIME– IP Security – IP Security Overview– IP Security Architecture – Authentication Header – Encapsulating Security Payload – Combining Security Associations – Web Security – Web Security Considerations – Secure Sockets Layer and Transport Layer Security – Secure Electronic Transaction	**10**	**25**

	SECOND INTERNAL TEST		
Module 4	**WIRELESS NETWORK SECURITY:**Security Attack issues specific to Wireless systems: Worm hole, Tunneling, DoS. WEP for Wi-Fi network, Security for 4G networks: Secure Ad hoc Network, Secure Sensor Network.	**10**	**25**
	END SEMESTER EXAM		
	Total Hours	**42**	

TEXT BOOKS:

1. William Stallings, “Cryptography and Network Security”, 3rd edition, Prentice Hall of India, New Delhi, 2004.
2. R.K.Nichols and P.C. Lekkas ,” Wireless Security” McGraw Hill 2002

Internal Continuous Assessment: 40 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC6235	SPEECH PROCESSING AND SYNTHESIS	3-0-0-3	2015

OBJECTIVES:

- *To understand the mathematical foundations needed for speech processing*
- *To understand the basic concepts and algorithms of speech processing and synthesis*
- *To familiarize the students with the various speech signal representation, coding and recognition techniques*

Syllabus

Fundamentals of Speech Processing, Speech Signal Representations and Coding,Speech Recognition and Speech Synthesis

EXPECTED OUTCOME

The students would be able to

- Easily tackle with the concept and algorithms of speech processing
- Understand the coding and recognition techniques

Course Plan

Module	Contents	Hours	Sem Exam Marks (%)
Module 1	**FUNDAMENTALS OF SPEECH PROCESSING** Introduction – Spoken Language Structure – Phonetics and Phonology – Syllables and Words – Syntax and Semantics – Probability, Statistics and Information Theory – Probability Theory – Estimation Theory – Significance Testing – Information Theory.	**10**	**25**
Module 2	**SPEECH SIGNAL REPRESENTATIONS AND CODING** Overview of Digital Signal Processing – Speech Signal Representations – Short time Fourier Analysis – Acoustic Model of Speech Production –	**6**	**13**
	FIRST INTERNAL TEST		
Module 2	Linear Predictive Coding – Cepstral Processing – Formant Frequencies – The Role of Pitch – Speech Coding – LPC Coder.	**6**	**12**
Module3	**SPEECH RECOGNITION** Hidden Markov Models – Definition – Continuous and Discontinuous HMMs – Practical Issues – Limitations. Acoustic Modeling – Variability in the Speech Signal – Extracting Features – Phonetic Modeling – Adaptive Techniques – Confidence Measures – Other Techniques.	**10**	**25**

	SECOND INTERNAL TEST		
Module 4	**SPEECH SYNTHESIS** Attributes – Formant Speech Synthesis – Concatenative Speech Synthesis – Prosodic Modification of Speech – Source-filter Models for Prosody Modification – Evaluation of TTS Systems	**10**	**25**
	END SEMESTER EXAM		
	Total Hours	**42**	

TEXT BOOKS:

1. Xuedong Huang, Alex Acero, Hsiao-Wuen Hon, “Spoken Language Processing – A guide to Theory, Algorithm and System Development”, Prentice Hall PTR, 2001.

2. Thomas F.Quatieri, “Discrete-Time Speech Signal Processing”, Pearson Education, 2002.

3. Lawrence Rabiner and Biing-Hwang Juang, “Fundamentals of Speech Recognition”, Prentice Hall Signal Processing
Series, 1993.

4. SadaokiFurui, “Digital Speech Processing: Synthesis, and Recognition, Second Edition, (Signal Processing and Communications)”, Marcel Dekker, 2000.

5. Joseph Mariani, “Language and Speech Processing”, Wiley, 2009.

Internal Continuous Assessment: 40 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC6245	WAVELET TRANSFORMS AND APPLICATIONS	3-0-0-3	2015

OBJECTIVES:

- *To study the basics of signal representation and Fourier theory*
- *To study the wavelet transform in both continuous and discretedomain*
- *To understand the applications of Wavelet transform*

Syllabus

Fundamentals, Continuous Wavelet Transforms, Discrete Wavelet Transform and Applications

EXPECTED OUTCOME

The students would be able to

- Familiarize with the concepts of signal representation and fourier theory
- Understand about the properties of wavelet transform

Course Plan

Module	Contents	Hours	Sem Exam Marks (%)
Module 1	**FUNDAMENTALS** 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.	**10**	**25**
Module 2	**CONTINUOUS WAVELET TRANSFORMS** Wavelet Transform – Definition and Properties – Concept of Scale and its Relation with Frequency – Continuous Wavelet Transform (CWT) –	**6**	**13**
	FIRST INTERNAL TEST		
Module 2	Scaling Function and Wavelet Functions (DaubechiesCoiflet, Mexican Hat, Sinc, Gaussian, Bi Orthogonal)– Tiling of Time – Scale Plane for CWT.	**6**	**12**
Module3	**DISCRETE WAVELET TRANSFORM** 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.	**10**	**25**

	SECOND INTERNAL TEST		
Module 4	**APPLICATIONS** 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.	**10**	**25**
	END SEMESTER EXAM		
	Total Hours	**42**	

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.

REFERENCES:

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, 2000.
4. Soman K P and Ramachandran K I, —Insight into Wavelets From Theory to practicell, Prentice Hall, 2004.

Internal Continuous Assessment: 40 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC6251	RESEARCH METHODOLOGY	0-2-0-2	2015

Objectives:

- *To give students an insight into the steps to be followed in doing a research*
- *To provide an idea about technical report writing*

Syllabus

Introduction, Data Collection and Analysis, Testing and Report writing

EXPECTED OUTCOME

The students would be able to

- Familiarize with the basic techniques in research work
- Understand the importance of research

Course Plan

Module	Contents	Hours	Sem Exam Marks (%)
\Module 1	**Introduction:** Research and Scientific methods, Objectives and Motivation of Research, Criteria of Good Research, research Approaches, Significance of research, Type of Researches, Research methods VS Methodology, Research problems, Defining a research problem, Research Design, Sampling Design	7	25
Module 2	**Data Collection and Analysis:** Collection of Primary Data, Observation method, Interview Method, Collection of data through Questionnaires and Schedules, Secondary Data, Processing operations, Statistics in research,	4	13
	FIRST INTERNAL TEST		
Module 2	Measures of central Tendency, Other methods of data collection, Collection of secondary data, Processing operations, Types of analysis, statistics in research, Dispersion, Asymmetry, relationship, Simple regression analysis, Partial correlation	3	12
Module3	**Testing :** Hypothesis-I - Introduction, Testing of Hypothesis, Procedure for hypothesis testing, Flow diagram for hypothesis testing, Measuring the power of hypothesis test, Tests of Hypothesis, Hypothesis testing of Means, Proportions, Correlation Coefficients, Chi-square test, Phi Coefficient, Hypothesis-II - Introduction, Nonparametric, Distribution-free Tests, Sign tests, Fisher-Irwin test, Spearman's Rank Correlation, Kendall's Coefficient of concordance	7	25
	SECOND INTERNAL TEST		

Module 4	**Report writing :** Introduction and Significant, Interpretation – Meaning, Techniques, and Precautions, Layout of research reports, Types of report, Mechanics and precautions of writing a research report, Computer role in research, computers and computer technology, computer system, Characteristics	**7**	**25**
	END SEMESTER EXAM		
	Total Hours	**28**	

Text Books:

1. CR Kothari, "Research Methodologies – Methods and Techniques", Second Edition, New Age International
2. John W Best and James V Kahn, " Research in Education", Fifth Edition, PHI, New Delhi
3. Pauline V Young, Scientific Social Surveys and Research, Third Editions, PHI New York

Internal Continuous Assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC6261	SEMINAR	0-2-0-2	2015

Objective:

- *Toassessthedebatingcapabilityofthestudenttopresentatechnicaltopic.*
- *Toimparttrainingtoastudenttofaceaudienceandpresenthis/herideasandthuscreatingselfesteemandcourageth atareessentialforanengineer.*

EXPECTED OUTCOME

The students would be able to

- Tackle the technical topics ideally
- Develop good communication skill

Instructions:

- Individualstudentsarerequiredtochooseatopicoftheirinterestpreferablyfromoutsidethe M.Techsyllabusandgiveaseminaron thattopicabout 45minutes.
- Acommittee consistingofatleastthreefacultymembersshallassessthepresentationoftheseminarandawardmarkstothe studentsbasedonmeritsoftopicofrepresentation.
- Eachstudentshallsubmittwocopiesofa writeupoftheseminartopic.
- Onecopyshallbereturnedtothestudentafterdulycertifyingitby thechairmanoftheassessingcommitteeandtheotherwillbekeptinthedepartmentallibrary.
- Internalcontinuousassessmentmarksareawardedbasedontherelevanceofthetopic, presentationskill, quality of the report and participation

Internal Continuous Assessment*(MaximumMarks-100)*

Subject Relevance – 10 marks

Concept/ Knowledge in the topic – 20 marks

Presentation – 40 marks

Report – 30marks

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC6271	ADVANCED SIGNAL PROCESSING LABORATORY	0-0-2-1	2015

OBJECTIVES

To carry out following experiments

- Design FIR filter.
- Design IIR filter.
- Design and implementation of RLS adaptive filter
- Stimulation and analysis of speech and image compression algorithms

EXPECTED OUTCOME

The students would be able to understand to

- Design FIR filter.
- Design IIR filter.
- Design and implement of RLS adaptive filter
- Stimulate and analyze the speech and image compression algorithms

	List of Experiments
1	Design FIR filter.
2	Design IIR filter.
3	Multistage implementation of decimation and interpolation.
4	Design and implementation of QMF filter bank.
5	Implementation of forward and backward predictors.
6	Design and implementation of LMS, adaptive filter (a)To remove noise (b)To estimate the channel
7	Design and implementation of RLS adaptive filter (a)To remove noise (b)To estimate the channel
8	Parametric / non parametric power spectral estimation.
9	Stimulation and analysis of speech and image compression algorithms.
10	Implementation of image denoising using wavelet transforms.

InternalContinuousAssessment*(MaximumMarks-100)*

Internal continuous assessment is in the form of periodical tests. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

SEMESTER – II

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC6212	ADVANCED MICROWAVE COMMUNICATION SYSTEM	4-0-0-4	2015

COURSE OBJECTIVES:

- To introduce the terminology used in microwave, analysis of RF and microwave transmissionlines
- To design the building blocks of an Microwave transmission system
- To measure various parameters at microwave frequencies
- To learn about microwave systems and its application in various fields

Syllabus

Introduction to Microwaves, Analysis of Microwave Transmission Lines, Microwave Design Principles and Modern Trends In Microwave Systems

OUTCOMES:Students would be able to :

- familiar with microwaves
- understand n/w parameters
- design microwave systems
- know the scopes of microwave systems

Course Plan

Module	Contents	Hours	Sem Exam Marks (%)
Module 1	**INTRODUCTION TO MICROWAVES** History of Microwaves, Microwave Frequency bands, Applications of Microwaves: Civil andMilitary, Medical, EMI/ EMC. Mathematical model of Microwave Transmission**,** Concept of Mode, Characteristics of TEM, TE and TM Modes, Losses in microwave transmission, Concept of Impedance in Microwave transmission.	**14**	**25**
Module 2	**ANALYSIS OF MICROWAVE TRANSMISSION LINES** Analysis of RF and Microwave Transmission Lines**-** Coaxial Line, Rectangular Waveguide, Circular waveguide, Stripline, Microstrip Line.	**7**	**13**
	FIRST INTERNAL TEST		
Module 2	Microwave Network Analysis **-**Equivalent Voltages and currents for non-TEM lines - Network parameters for microwave Circuits - Scattering Parameters.	**7**	**12**
Module3	**MICROWAVE DESIGN PRINCIPLES** Impedance transformation, Impedance Matching, Microwave Filter Design, RF and Microwave Amplifier Design, Microwave Power amplifier Design, Low Noise Amplifier Design, microwave Mixer Design, Microwave Oscillator Design. Microwave Antenna**-** Microwave Antenna Parameters, Microwave antenna for ground based systems, Microwave antenna for airborne based systems Microwave antenna for satellite borne systems, Microwave Planar Antenna.	**14**	**25**

	SECOND INTERNAL TEST		
Module 4	**MODERN TRENDS IN MICROWAVE SYSTEMS**Radar Systems, Cellular Phone, Satellite Communication, RFID, GPS. Modern Trends inMicrowaves Engineering - Effect of Microwaves on human body, Medical and Civil applications of microwaves, Electromagnetic interference / Electromagnetic Compatibility (EMI / EMC), Monolithic Microwave IC fabrication, RFMEMS for microwave components, Microwave Imaging.	**14**	**25**
	END SEMESTER EXAM		
	Total Hours	**56**	

TEXT BOOKS:

1. David M. Pozar, "Microwave Engineering", fourth Edition, Wiley India, 2011
2. R.E.Collin, "Foundations for Microwave Engineering", Second edition, John wiley& sons, 2007.
3. S. Ramo, J.R.Whinnery and T.V.Duzer, "Fields and Waves in Communication Electronics", Third Edition, Wiley India, 1994

Internal Continuous Assessment: 40 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC6222	ADVANCED OPTICAL COMMUNICATION SYSTEMS	3-0-0-3	2015

COURSE OBJECTIVES:

- To introduce the terminology used in optical fibers
- To describe the building blocks of an Optical Fiber system
- To introduce coherent and multichannel systems

Syllabus

Introduction to Optical Communication, Optical Transmitters and Receivers , Advanced Light wave Systems and Multichannel Systems

OUTCOMES:

Student would be able to:

- get idea about opticalcommunication
- learn simple transmitters and receivers
- understand various modulation schemes
- know multiplexing techniques

Course Plan

Module	Contents	Hours	Sem Exam Marks (%)
Module 1	**INTRODUCTION TO OPTICAL COMMUNICATION** Evolution of Light wave systems, System components, Optical fibers - Step Index & Graded index - Mode theory, Fiber modes – Dispersion in fibers, Limitations due to dispersion - - Fiber Losses Non-linear effects	**10**	**25**
Module 2	**OPTICAL TRANSMITTERS AND RECEIVERS**Transmitter's basic concepts - LED's structures - Spectral Distribution - Semiconductor lasers -Threshold conditions – Single mode semiconductor laser –Laser Characteristics- Modulation -Transmitter design	**6**	**13**
	FIRST INTERNAL TEST		
Module 2	Receiver's basic Concepts - PIN and APD diodes structures- Photo detector-Noise- Receiver sensitivity – BER and quantum limit - Receiver design	**6**	**12**
Module3	**ADVANCED LIGHTWAVE SYSTEMS**Homodyne and heterodyne detectors – Advanced modulation formats - Demodulation schemes - BER in synchronous receivers - Sensitivity degradation –Systems with the DBPSK format and DQPSK – System employing Orthogonal FDM	**10**	**25**
	SECOND INTERNAL TEST		
Module 4	**MULTICHANNEL SYSTEMS**WDM systems, multiple access networks - WDM Components - XPM based and FWM based wavelength converters – Fiber based optical regenerator - Hetero	**10**	**25**

	wavelength linear crosstalk and homo wavelength Linear Crosstalk – TDM - CD multiplexing		
	END SEMESTER EXAM		
	Total Hours	**42**	

REFERENCES

1. G.P.Agrawal, "Fiber Optic Communication Systems", 4th Edition, John Wiley & Sons, 2010.
2. John M. Senior, “Optical Fiber Communications –Principles and Practice”, 2nd Edition,Pearson Education, 2009
3. G. Keiser, "Optical Fiber Communication Systems", 4th edition, Tata McGrawHill. Edition, 2010.
4. Djafar.K. Mynbaev Lowell and Scheiner, "Fiber Optic Communication Technology", Pearson Education Asia, 2009.
5. F.J.H. Franz and V.K. Jain, "Optical Communication System", Narosa Publishing House, New Delhi 2000

Internal Continuous Assessment: 40 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC6232	ADVANCED SATELLITE BASED SYSTEMS	3-0-0-3	2015

COURSE OBJECTIVES:

To provide in-depth treatment on methods and techniques in

- Navigation, tracking and safety systems
- Inertial navigation and differential GPS systems
- Satellite networking system with IPV6

SyllabusNavigation, Tracking and Safety Systems, Inertial Navigation and Differential GPS Systems, Broadcast Systems and Satellite Networking System with IPV6

OUTCOMES:Students would be able to:

- Understand satellite broadcasting
- Use IPv6 IN satellite systems

Course Plan

Module	Contents	Hours	Sem Exam Marks (%)
Module 1	**NAVIGATION, TRACKING AND SAFETY SYSTEMS** Global Navigation Satellite Systems - Basic concepts of GPS. Space segment, Control segment, user segment, GPS constellation, GPS measurement characteristics, selective availability (AS), Anti spoofing (AS). Applications of Satelite 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.	**10**	**25**
Module 2	**INERTIAL NAVIGATION AND DIFFERENTIAL GPS SYSTEMS** Introduction to Inertial Navigation- Inertial Sensors - Navigation Coordinates-System Implementations- System-Level Error Models-	**6**	**13**
	FIRST INTERNAL TEST		
Module 2	Introduction to Differential GPS- LADGPSWADGPS- WAAS - GEO Uplink Subsystem (GUS) - GEO Uplink Subsystem (GUS) Clock Steering Algorithms - GEO Orbit Determination - Problems	**6**	**12**
Module3	**BROADCAST SYSTEMS** Introduction - Satellite Radio Systems - XM Satellite Radio Inc. - Sirius Satellite Radio –world space - 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.	**10**	**25**

	SECOND INTERNAL TEST		
Module 4	**SATELLITE NETWORKING SYSTEM WITH IPV6** Overview of IPv6 and its benefits- 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.	**10**	**25**
	END SEMESTER EXAM		
	Total Hours	**42**	

REFERENCES:

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

Internal Continuous Assessment: 40 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC6216	COMMUNICATION SWITCHING & MULTIPLEXING	3-0-0-3	2015

COURSE OBJECTIVES:

The purpose of this course is to provide in-depth treatment on methods and techniques in various switching and multiplexing schemes used in telecommunication networks

Syllabus

Switching- Performance and architectural issues, Types of blocking for a packet switch, Multiplexing and

Statistical multiplexing

OUTCOMES:

Student would be able to:

- Distinguish packet and circuit switching
- Learn various multiplexing techniques
- Understand blocking in multiplexed networks

Course Plan

Module	Contents	Hours	Sem Exam Marks (%)
Module 1	**Switching: Performance and architectural issues:** Packetswitches-Circuitswitches.Time and Space division switching-Point to point circuit switching-multistage switching network-Paull'smatixfor representing connections-Strict sense non-locking Closnetwork.Generalized circuit switching-Cross Point Complexity(CPC)-Fast packet switching-Self routing Banyannetworks-Combinatorial limitations of Banyan networks.	**10**	**25**
Module 2	**Types of blocking for a packet switch**- Output conflicts- HOL blocking. Traffic analysis: Traffic measurements, arrival distributions,**Poisson process**, holding/service time distributions, loss systems, lost calls cleared–Erlang-B formula, lost calls returning and lost calls held models, lost calls cleared and held models with finite sources, delay systems,	**6**	**13**
	FIRST INTERNAL TEST		
Module 2	Little's theorem, Erlang-C formula, M/G/1model.**Blocking probability:** Analysis of single stage and multistage networks– Blocking for unique path routing-Alternate path routing- The Leeapproximation – The Jacobaeus method.	**6**	**12**
Module3	**Multiplexing:** Network performance and source characterization; Stream sessions in packet networks - deterministic analysis, stochastic analysis,circuit multiplexed networks; Elastic transfers in packet networks-adaptive bandwidth sharing.	**10**	**25**
	SECOND INTERNAL TEST		
Module 4	**Statistical multiplexing:** Blocking analysis in circuit multiplexed networks, with single rate or multi rate traffic- Models for performance analysis of integrated packetnetworks; deterministic models, worst case analysis;	**10**	**25**

	stochastic models, large deviations analysis. The effective Bandwidth approach for Admission control-Models for traffic flow in packet networks, long range dependence and self similar processes.		
	END SEMESTER EXAM		
	Total Hours	**42**	

TEXT BOOKS:

1. A.Kumar,D.Manjunath,J.Kuri,CommunicationNetworking:AnAnalyticalApproach, Morgan Kaufman Publishers, 2004.
2. Hui,J.Y.,SwitchingandTrafficTheoryforIntegratedBroadbandNetworks,Kluwer, 1990.

Internal Continuous Assessment: 40 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC6226	MULTIMEDIA COMPRESSION TECHNIQUES	3-0-0-3	2015

COURSE OBJECTIVES:

The purpose of this course is to provide in-depth treatment on methods and techniques in Data Compression,Text Compression and Audio Compression ,Image and Video Compression

Syllabus

Introduction , Text Compression , Image Compression and Video Compression

OUTCOMES:

Student would be able to Get idea about multimedia , Distinguish text, audio andvideo data and Familiar with different coding techniques

Course Plan

Module	Contents	Hours	Sem Exam Marks (%)
Module 1	**INTRODUCTION** Special features of Multimedia – Graphics and Image Data Representations – FundamentalConcepts 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	10	25
Module 2	**TEXT COMPRESSION** Compaction techniques – Huffmann coding – Adaptive Huffmann Coding –	6	13
	FIRST INTERNAL TEST		
Module 2	Arithmatic coding – Shannon-Fano coding – Dictionary techniques – LZW family algorithms.	6	12
Module3	**IMAGE COMPRESSION** Predictive techniques – DM, PCM, DPCM: Optimal Predictors and Optimal Quantization– Contour based compression – Transform Coding – JPEG Standard – Sub-band coding algorithms: Design of Filter banks – Wavelet based compression: Implementation using filters – EZW, SPIHT coders – JPEG 2000 standards – JBIG, JBIG2 Standards	10	25
	SECOND INTERNAL TEST		
Module 4	**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 – DVI technology – PLV performance – DVI real time compression – Packet Video.	10	25

	END SEMESTER EXAM		
	Total Hours	**42**	

TEXT 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, Huifang Sun : 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

Internal Continuous Assessment: 40 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC6236	NETWORK ROUTING ALGORITHMS	3-0-0-3	2015

COURSE OBJECTIVES:

- To expose the students to the layered architecture for communication networks
- To enable the student to understand the basic principles of routing

Syllabus

Introduction, Internet Routing, Routing In Optical WDM Networks and Mobile - IP Networks

OUTCOMES:

Student would be able to

- know layer architecture
- Understand different routing protocols

Course Plan

Module	Contents	Hours	Sem Exam Marks (%)
Module 1	**INTRODUCTION** ISO OSI Layer Architecture, TCP/IP Layer Architecture, Functions of Network layer, General Classification of routing, Routing in telephone networks, Dynamic Non hierarchical Routing (DNHR), Trunk status map routing (TSMR), real-time network routing (RTNR), Distance vector routing, Link state routing, Hierarchical routing.	10	25
Module 2	**INTERNET ROUTING** Interior protocol : Routing Information Protocol (RIP), Open Shortest Path First (OSPF), Bellman Ford Distance Vector Routing. Exterior Routing Protocols: Exterior Gateway Protocol (EGP) and Border Gateway Protocol (BGP).	6	13
	FIRST INTERNAL TEST		
Module 2	Multicast Routing: Pros and cons of Multicast and Multiple Uni cast Routing, Distance Vector Multicast Routing Protocol (DVMRP), Multicast Open Shortest Path First (MOSPF), MBONE, Core Based Tree Routing.	6	12
Module3	**ROUTING IN OPTICAL WDM NETWORKS** Classification of RWA algorithms, RWA algorithms, Fairness and Admission Control, Distributed Control Protocols, Permanent Routing and Wavelength Requirements, Wavelength Rerouting-Benefits and Issues, Lightpath Migration, Rerouting Schemes, Algorithms- AG, MWPG	10	25
	SECOND INTERNAL TEST		
Module 4	**MOBILE - IP NETWORKS** Macro-mobility Protocols, Micro-mobility protocol: Tunnel based : Hierarchical Mobile IP, Intra domain Mobility Management, Routing based: Cellular IP, Handoff Wireless Access Internet	10	25

	Infrastructure (HAWAII).		
	END SEMESTER EXAM		
	Total Hours	**42**	

REFERENCES:

1. William Stallings, ' High speed networks and Internets Performance and Quality of Service', IInd Edition, Pearson Education Asia. Reprint India 2002

2. M. Steen Strub, ' Routing in Communication network, Prentice –Hall International, Newyork,1995.

3. S. Keshav, 'An engineering approach to computer networking' Addison Wesley 1999.

4. William Stallings, 'High speed Networks TCP/IP and ATM Design Principles, Prentice- Hall,New York, 1995

5. C.E Perkins, 'Ad Hoc Networking', Addison – Wesley, 2001

6. Ian F. Akyildiz, Jiang Xie and ShantidevMohanty, " A Survey of mobility Management in Next generation All IP- Based Wireless Systems", IEEE Wireless Communications Aug.2004, pp 16-

7. A.T Campbell et al., " Comparison of IP Micromobility Protocols," IEEE Wireless communications Feb.2002, pp 72-82.

8. C.Siva Rama Murthy and Mohan Gurusamy, " WDM Optical Networks – Concepts, Design and Algorithms", Prentice Hall of India Pvt. Ltd, New Delhi –2002

Internal Continuous Assessment: 40 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC6246	CLOUD COMPUTING	3-0-0-3	2015

COURSE OBJECTIVES:

To provide in-depth treatment on methods and techniques in

- Cloud computing
- Developing cloud services
- Cloud computing for everyone
- Using cloud services

Syllabus

Understanding Cloud Computing, Developing Cloud Services, Cloud Computing for Everyone ,Using Cloud Services

OUTCOMES:

Student would be able to:

- Familiar with cloud computing
- Understand various cloud services
- Use cloud computing

Understand the applications of cloud computing

Course Plan

Module	Contents	Hours	Sem Exam Marks (%)
Module 1	**UNDERSTANDING CLOUD COMPUTING** Cloud Computing – History of Cloud Computing – Cloud Architecture – Cloud Storage –Why Cloud Computing Matters – Advantages of Cloud Computing – Disadvantages of Cloud Computing – Companies in the Cloud Today – Cloud Services	**10**	**25**
Module 2	**DEVELOPING CLOUD SERVICES** Web-Based Application – Pros and Cons of Cloud Service Development – Types of Cloud Service Development – Software as a Service – Platform as a Service –	**6**	**13**
	FIRST INTERNAL TEST		
Module 2	Web Services – On-Demand Computing – Discovering Cloud Services Development Services and Tools – Amazon Ec2 – Google App Engine – IBM Clouds	**6**	**12**
Module3	**CLOUD COMPUTING FOR EVERYONE** Centralizing Email Communications – Collaborating on Schedules – Collaborating on To-Do Lists – Collaborating Contact Lists – Cloud Computing for the Community – Collaborating on Group Projects and Events – Cloud Computing for the Corporation	**10**	**25**
	SECOND INTERNAL TEST		

Module 4	**USING CLOUD SERVICES** Collaborating on Calendars, Schedules and Task Management – Exploring Online Scheduling Applications – Exploring Online Planning and Task Management – Collaborating on Event Management – Collaborating on Contact Management – Collaborating on Project Management – Collaborating on Word Processing - Collaborating on Databases – Storing and Sharing Files	**10**	**25**
	END SEMESTER EXAM		
	Total Hours	**42**	

REFERENCES

1. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, August 2008.

2. Haley Beard, Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008.

Internal Continuous Assessment: 40 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC6266	ADVANCED DIGITAL IMAGE PROCESSING	3-0-0-3	2015

COURSE OBJECTIVES:

- To understand the image fundamentals and mathematical transforms necessary for image processing and to study the image enhancement techniques.
- To understand the image segmentation and representation techniques.
- To understand how image are analyzed to extract features of interest.
- To introduce the concepts of image registration and image fusion.

To analyze the constraints in image processing when dealing with3D datasets.

Syllabus

Fundamentals of Digital Image Processing, Segmentation, 3D Image Visualization and Feature Extraction

OUTCOMES:

Student would be able to:

- Get basic idea about image processing
- Learn the segmentation concept
- Understand extract features from the data

Course Plan

Module	Contents	Hours	Sem Exam Marks (%)
Module 1	**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	10	25
Module 2	**SEGMENTATION** Edge detection, Thresholding, Region growing, Fuzzy clustering, Watershed algorithm, Active contour methods	6	13
	FIRST INTERNAL TEST		
Module 2	,Texture feature based segmentation, Model based segmentation, Atlas based segmentation, Wavelet based Segmentation methods	6	12
Module3	**FEATURE EXTRACTION** First and second order edge detection operators, Phase congruency, Localized feature extractiondetecting image curvature, shape features Hough transform, shape skeletonization, Boundary descriptors, Moments, Texture descriptors- Autocorrelation, Co-occurrence features, Runlength features, Fractal model based features, Gabor filter, wavelet features.	10	25

	SECOND INTERNAL TEST		
Module 4	**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.	**10**	**25**
	END SEMESTER EXAM		
	Total Hours	**42**	

TEXT 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. ArdeshirGoshtasby, “ 2D and 3D Image registration for Medical, Remote Sensing and Industrial Applications”,John Wiley and Sons,2005.

REFERENCES:

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', Pearson Education,Inc., 2002.

3. Rick S.Blum, Zheng Liu,“Multi sensor image fusion and its Applications“, Taylor& Francis,2006.

Internal Continuous Assessment: 40 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC6276	ANTENNA THEORY AND DESIGN	3-0-0-3	2015

COURSE OBJECTIVES:

- To provide in-depth understanding of modern antenna concepts, and practical antenna design for various applications
- To explain the theory of different types of antennas used in communication systems
- To provide in-depth study for the analysis and design of arrays
- To provide an overview of advanced analytical and numerical methods used to analyzeand design antennas.

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Syllabus

Fundamental Concepts and Radiation From Wire Antennas, Antenna Arrays and Synthesis

Aperture and Reflector Antennas, Broadband and Microstrip Antennas

OUTCOMES:

Students would be able to: Learn antenna arrays and Distinguish radiation pattern of single antenna and antenna arrays

Course Plan

Module	Contents	Hours	Sem Exam Marks (%)
Module 1	**FUNDAMENTAL CONCEPTS AND RADIATION FROM WIRE ANTENNAS** Physical concept of radiation- Radiation pattern-near-and far-field regions,-antenna theorem formulation of fundamental antenna properties -Friis transmission equation-radiation integrals and auxiliary potential functions-Infinitesimal dipole-finite-length dipole-linear elements near conductors-dipoles for mobile communication-small circular loop.	10	25
Module 2	**ANTENNA ARRAYS AND SYNTHESIS** Linear arrays-Analysis of uniformly spaced arrays with uniform and non-uniform excitation amplitudes –binomial array-phased array- synthesis of antenna arrays -	6	13
	FIRST INTERNAL TEST		
Module 2	Schelkunoff polynomial method- Woodward-Lawson method-Fourier transform method-Taylor method- Integral equations moment method-impedances.	6	12
Module3	**APERTURE AND REFLECTOR ANTENNAS** Huygens' principle- radiation from rectangular and circular apertures- design considerations - Babinet's principle -Radiation from sectoral and pyramidal horns-design concepts prime-focus parabolic reflector and cassegrain antennas.	10	25
	SECOND INTERNAL TEST		

Module 4	**BROADBAND AND MICROSTRIP ANTENNAS** Log-periodic and Yagi antennas- frequency independent antennas- helical antennas –Basic characteristics of microstrip antennas -feeding methods- methods of analysis -design of rectangular and circular patch antennas-microstrip arrays	**10**	**25**
	END SEMESTER EXAM		
	Total Hours	**42**	

REFERENCES

1. C. A. Balanis, "Antenna Theory Analysis and Design", 3rd Ed., John Wiley & Sons, 2008.
2. W. L. Stutzman, and G. A. Thiele, "Antenna Theory and Design", 2nd Ed., John Wiley & Sons, 2010.
3. R. S. Elliot, "Antenna Theory and Design", Revised edition, Wiley-IEEE Press, 2005.
4. R. E. Collin, "Antennas and Radio Wave Propagation", McGraw-Hill., 1985.
5. F. B. Gross, "Smart Antennas for Wireless Communications", McGraw-Hill, 2005.
6. John.D.Kraus and R.J.Marhetka,"Antennas for all Applications"3rd edition. Tata McGraw Hill, 2008.

Internal Continuous Assessment: 40 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC6286	NEURAL NETWORK AND APPLICATIONS	3-0-0-3	2015

COURSE OBJECTIVES:

To provide in-depth treatment on methods and techniques in

- Basic learning algorithms
- Radial basis function networks
- Committee machines

Attractor neural networks

Syllabus

Basic Learning Algorithms , Radial Basis Function Networks , Committee Machines , Attractor Neural Networks

OUTCOMES:

Student would be able to:

- Grasp the concept of neural network
- Practice with the basic algorithms and basic functions
- Understand the necessity of neural networks

Manage with the committee machines

Course Plan

Module	Contents	Hours	Sem Exam Marks (%)
Module 1	**BASIC LEARNING ALGORITHMS** Biological Neuron – Artificial Neural Model - Types of activation functions – Architecture: Feed forward and Feedback – Learning Process: Error Correction Learning –Memory Based Learning – Hebbian Learning – Competitive Learning - Boltzman Learning – Supervised and Unsupervised Learning – Learning Tasks: Pattern Space – Weight Space – Pattern Association –Pattern Recognition – Function Approximation – Control – Filtering - Beamforming – Memory – Adaptation -	**10**	**25**
Module 2	**RADIAL BASIS FUNCTION NETWORKS** Cover's Theorem on the Separability of Patterns - Exact Interpolator – Regularization Theory – Generalized Radial Basis Function	**6**	**13**
	FIRST INTERNAL TEST		
Module 2	Networks - Learning in Radial Basis Function Networks Applications: XOR Problem – Image Classification.	**6**	**12**
Module3	**COMMITTEE MACHINES** Ensemble Averaging - Boosting – Associative Gaussian Mixture Model – Hierarchical Mixture of Experts Model(HME) – Model Selection using a Standard Decision Tree – A Priori and Postpriori Probabilities – Maximum Likelihood Estimation – Learning Strategies for the HME Model - EMAlgorithm – Applications of EM Algorithm to HME Model	**10**	**25**
	SECOND INTERNAL TEST		

Module 4	**ATTRACTOR NEURAL NETWORKS:** Associative Learning – Attractor Neural Network Associative Memory – Linear Associative Memory – Hopfield Network – Content Addressable Memory – Strange Attractors and Chaos- Error Performance of Hopfield Networks - Applications of Hopfield Networks – Simulated Annealing – Boltzmann Machine – Bidirectional Associative Memory – BAM Stability Analysis – Error Correction in BAMs - Memory Annihilation of Structured Maps in BAMS – Continuous BAMs – Adaptive BAMs – Applications	**10**	**25**
	END SEMESTER EXAM		
	Total Hours	**42**	

REFERENCES:

1. Satish Kumar, “Neural Networks: A Classroom Approach”, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2004.

2. Simon Haykin, “Neural Networks: A Comprehensive Foundation”, 2ed., Addison Wesley Longman (Singapore) Private Limited, Delhi, 2001.

3. Martin T.Hagan, Howard B. Demuth, and Mark Beale, “Neural Network Design”, Thomson Learning, New Delhi, 2003.

4. James A. Freeman and David M. Skapura, “Neural Networks Algorithms, Applications, and Programming Techniques, Pearson Education (Singapore) Private Limited, Delhi,2003.

Internal Continuous Assessment: 40 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC6296	GRID COMPUTING	3-0-0-3	2015

COURSE OBJECTIVES:

To understand

- Concepts and architecture
- Grid monitoring
- Grid security and resource management

Syllabus

Concepts and Architecture, Grid Monitoring ,Grid Security and Resource Management and Data Management and Grid Portals

OUTCOMES

The students would be able to

- Practice with the basic concepts and architecture of grid computing
- Understand about the security and resource management
- Manage with the grid monitoring and data management

Course Plan

Module	Contents	Hours	Sem Exam Marks (%)
Module 1	**CONCEPTS AND ARCHITECTURE** Introduction-Parallel and Distributed Computing-Cluster Computing-Grid Computing- Anatomy and Physiology of Grid- Web and Grid Services-Grid Standards – OGSAWSRF - Trends, Challenges and applications.	**10**	**25**
Module 2	**GRID MONITORING** Grid Monitoring Architecture (GMA) - An Overview of Grid Monitoring Systems- R-GMA - GridICE – MDS- Service Level Agreements (SLAs) -	**6**	**13**
	FIRST INTERNAL TEST		
Module 2	Other Monitoring Systems- Ganglia, GridMon, Hawkeye and Network Weather Service.	**6**	**12**
Module3	**GRID SECURITY AND RESOURCE MANAGEMENT** Grid Security-A Brief Security Primer-PKI-X509 Certificates-Grid Security-Grid Scheduling and Resource Management, Gridway and Gridbus Broker-principles of Local Schedulers- Overview of Condor, SGE, PBS, LSF-Grid Scheduling with QoS	**10**	**25**
	SECOND INTERNAL TEST		

Module 4	**DATA MANAGEMENT AND GRID PORTALS** Data Management-Categories and Origins of Structured Data-Data Management Challenges-Architectural Approaches-Collective Data Management Services-Federation Services-Grid Portals-Generations of Grid Portals.	**10**	**25**
	END SEMESTER EXAM		
	Total Hours	**42**	

REFERENCES:

1. Ian Foster, Carl Kesselman, The Grid 2: Blueprint for a New Computing Infrastructure, Elsevier Series, 2004.

2. Vladimir Silva, Grid Computing for Developers, Charles River Media, January 2006.

3. Parvin Asadzadeh, Rajkumar Buyya, Chun Ling Kei, Deepa Nayar, and Srikumar Venugopal, Global Grids and Software Toolkits: A Study of Four Grid Middleware Technologies, High Performance Computing: Paradigm and Infrastructure, Laurence Yang and MinyiGuo (editors), Wiley Press, New Jersey, USA, June 2005.

4. Jarek Nabrzyski, Jennifer M. Schopf, Jan Weglarz, Grid Resource Management: State of the Art and Future Trends , (International Series in Operations Research & Management Science), Springer; First edition, 2003

5. Srikumar Venugopal, Krishna Nadiminti, Hussein Gibbins and RajkumarBuyya,

6. Designing a Resource Broker for Heterogeneous Grids, Software: Practice and Experience, Wiley Press, New York, USA, 2008.

7. Fran Berman , Geoffrey Fox, Anthony J.G. Hey, Grid Computing: Making The Global Infrastructure a Reality, Wiley, 2003

8. MaozhenLi , Mark Baker , The Grid: Core Technologies, Wiley, 2005

9. JoshyJoseph , Craig Fellenstein Grid Computing, IBM Press, 2004

10. Borja Sotomayor , Lisa Childers, Globus Toolkit 4 : Programming Java Services , The Elsevier Series in Grid Computing, Morgan Kaufmann, 2005

Internal Continuous Assessment: 40 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC6262	MINI PROJECT	0-0-4-2	2015

OBJECTIVES

- To estimate the ability of the student in transforming theoretical knowledge so far into working model
- To enable the students to gain experience in organization and implementation of a small project and thus acquire the necessary confidence to carry out main project

OUTCOMES

The students would be able to

- Practice with the basic concepts in the field and its implementation in various fields
- Manage with the working model with the necessary knowledge support

Instructions

- The basic concepts of the design may be taken into consideration while designing the project.
- In this practical course each one is expected to design and develop a moderately complex system with practical applications.
- Students shall form a group, each group consist of maximum of 2 members.
- Students have to submit a report on the mini project and demonstrate the mini project before the evaluation committee
- TheEvaluation committee consisting of minimum three faculty members will perform the assessment of the mini project.

Internal Continuous Assessment: 100 marks

Attendance & Regularity - 10+10 marks

Evaluation I – 30 marks

Evaluation II-30 marks

Assessment by Guide – 20 marks

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC6272	ADVANCED COMMUNICATION SYSTEM LABORATORY	0-0-2-1	2015

OBJECTIVES

- Toimplement BPSK, QPSK, DPSK. Schemes
- To implement matched filter equalizer
- To implement network security algorithm

OUTCOMES

Students would be able

- To understand the implementation of BPSK, QPSK, DPSK. Schemes
- To understand the implementation of matched filter equalizer
- To understand the implementation of network security algorithm

List of Experiments

1	Implementation of modulation and demodulation schemes BPSK, QPSK, DPSK.
2	Implementation of communication over fading channels.
3	Implementation of matched filter, equalizer.
4	Simulation of CDMA transmitter and receiver.
5	Design and performance analysis of error control encoder and decoder(CRC, convolution codes)
6	OFDM transceiver design using mat lab
7	Stimulation and performance evaluation of routing protocols using NS2 /QUALNET
8	Design and implementation of network security algorithm, authentication protocols using mat lab.
9	Design and characterization of antennas using ADS/HFSS
10	Implementation Diversity techniques

Internal Continuous Assessment *(Maximum Marks-100)*

Internal continuous assessment is in the form of periodical tests. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

SEMESTER – III

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC7217	CODING TECHNIQUES FOR SPREAD SPECTRUM	3-0-0-3	2015

COURSE OBJECTIVES:

- To Design a system using a convolution code
- To Design codes to correct burst errors
- To Understand the motivation for and theory of trellis coded modulation
- To Design a system using turbo codes

Syllabus

Spread Spectrum Overview, Convolutional Codes and Viterbi Decoding Algorithm , Error Control For Channels With Feedback and Sequential Decoding Algorithms & Burst Error Correcting Code

OUTCOMES

The students would be able to

- Familiarize with the spread spectrum communications, and different codes.
- Understand the errors and error control mechanisms in communication

Course Plan

Module	Contents	Hours	Sem Exam Marks (%)
Module 1	**SPREAD SPECTRUM OVERVIEW** Definition and Beneficial attributes of a spread spectrum system – Catalog of spreading techniques - Pseudonoise sequences – Direct-sequence spread-spectrum systems and applications.	**10**	**25**
Module 2	**CONVOLUTIONAL CODES AND VITERBI DECODING ALGORITHM** Linear convolutional encoders – Structural properties of convolutional codes – State diagrams – Transparent convolutional codes – Receiver phase offset and Differential decoding –	**6**	**13**
	FIRST INTERNAL TEST		
Module 2	Trellisdiagrams – Viterbi algorithm – Performance analysis – Design and Implementation of Viterbidecoder – Punctured convolutional codes.	**6**	**12**
Module3	**SEQUENTIAL DECODING ALGORITHMS & BURST ERROR CORRECTING CODE** Tree diagrams – The Fano algorithm – The Stack algorithm – Performance analysis for Sequential decoders – Burst error correcting codes – Decoding of single burst error correcting cyclic codes – Fire interleaved codes – Phased burst error correcting codes – Concatenated codes.	**10**	**25**

	SECOND INTERNAL TEST		
Module 4	**ERROR CONTROL FOR CHANNELS WITH FEEDBACK** Pure ARQ Protocols – Noisy feedback channels – Type I Hybrid ARQ Protocols – Type II Hybrid ARQ Protocols and Packet combining.	**10**	**25**
	END SEMESTER EXAM		
	Total Hours	**42**	

REFERENCES:

1. Stephen B. Wicker, “Error control systems for Digital communication and storage”, Prentice Hall, Upper Saddle River, NJ, 1995.
2. Shu Lin, Daniel Costello, “Error control coding – Fundamentals and Applications”, Second Edition, Prentice Hall, Upper Saddle River, NJ, 2004.
3. Sklar, B., “Digital Communications: Fundamentals and Applications”, Prentice Hall Inc., NJ,2001.
4. E. Biglieri, et al. “Introduction to Trellis coded modulation with Applications”, Macmillan Publishers, 1991.
5. R. Johannesson and K.S. Zigangirov, “Fundamentals of Convolutional coding”, IEEE Series on Digital and Mobile Communication, Wiley-IEEE Press, 1999.

Internal Continuous Assessment: 50 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC7227	HIGH SPEED COMMUNICATION NETWORKS	3-0-0-3	2015

OBJECTIVES

- To discuss Layered Network Architectures, Point-To-Point Protocols and Links and Delay Models In Data Networks

Syllabus

Layered Network Architectures, Point-To-Point Protocols and Links, Delay Models In Data Networks and

Routing In Data Networks and Internet Routing

OUTCOMES

The students would be able to understand Layered Network Architectures, Point-To-Point Protocols and Links and Delay Models In Data Networks

Course Plan

Module	Contents	Hours	Sem Exam Marks (%)
Module 1	**LAYERED NETWORK ARCHITECTURES** Review of Open Systems Interconnection (OSI) and Transmission Control Protocol/Internet Protocol, and Internetworking	**10**	**25**
Module 2	**POINT-TO-POINT PROTOCOLS AND LINKS** Error detection – ARQ: Retransmission strategies – Framing – Point-to-point protocols at the network layer –	**6**	**13**
	FIRST INTERNAL TEST		
Module 2	The Transport layer – Broadband ISDN – Frame Relay – Asynchronous Transfer Mode.	**6**	**12**
Module3	**DELAY MODELS IN DATA NETWORKS** M/M/1, M/M/m, M/M/m/m, M/M/∞, M/G/1 queuing models – Networks of Transmission lines - Time reversibility (Burke's theorem) – Network of Queues (Jackson's theorem).	**10**	**25**
	SECOND INTERNAL TEST		
Module 4	**ROUTING IN DATA NETWORKS AND INTERNET ROUTING** Wide area networking – Interconnected network Routing – Shortest path Routing –Multicast/ Broadcast Routing information – Flow models – Optimal Routing and Topological design –	**10**	**25**

	Characterization of Optimal Routing – Interior and Exterior Routing protocols.		
	END SEMESTER EXAM		
	Total Hours	**42**	

REFERENCES

1. Dimitri Bert sekas and Robert Gallager , “Data networks” ,Second Edition, Prentice Hall, Inc., NJ, USA1992

2. William Stalling, “High Speed Networks and Internets”, Second Edition, Pearson Education Inc., New Delhi, India, 2002

3. Leon Garcia and Widjaja ,“ Communication networks: Fundamental concepts and key architectures”, McGraw Hill, Inc., NY, USA, 2006

4. Jean Walrand , “ Communication networks”, McGraw Hill, Inc., NY, USA, 1998.

Internal Continuous Assessment: 40 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC7237	INTERNETWORKING MULTIMEDIA	3-0-0-3	2015

COURSE OBJECTIVES:

To provide in-depth treatment on methods and techniques in

- Multimedia networking
- Broadband network technology
- Reliable transport protocol and applications

Syllabus

Multimedia Networking, Broadband Network Technology, Reliable Transport Protocol and Applications and

Multimedia Communication Standards

OUTCOMES

The students would be able to

- Familiarize with the multimedia networking and broadband network technology
- Manage with the transport protocol and its application \

Course Plan

Module	Contents	Hours	Sem Exam Marks (%)
Module 1	**MULTIMEDIA NETWORKING** 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.	**10**	**25**
Module 2	**BROADBAND NETWORK TECHNOLOGY** Broadband Services – ATM and IP, IPV6, High Speed Switching – Resource Reservation, Buffer Management – Traffic Shaping – Caching – Scheduling and Policing, Throughput, Delay and Jitter Performance –	**6**	**13**
	FIRST INTERNAL TEST		
Module 2	Storage and Media Services – Voice and Video Over IP – MPEG–2 over ATM/IP – Indexing Synchronization of Requests – Recording and Remote Control .	**6**	**12**
Module3	**RELIABLE TRANSPORT PROTOCOL AND APPLICATIONS** 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 .	**10**	**25**
	SECOND INTERNAL TEST		
Module 4	**MULTIMEDIA COMMUNICATION STANDARDS** Objective of MPEG – 7 Standard – Functionalities and Systems of MPEG–7 MPEG–21 Multimedia	**11**	**25**

	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.		
	END SEMESTER EXAM		
	Total Hours	**42**	

REFERENCES:

1. B O Szuprowicz, “Multimedia Networking”, McGraw Hill, Newyork, 1995.
2. K R Rao, Zoran S, Bojkovic and Dragorad A, Milovanovic “Multimedia communication systems”, PHI, 2003.
3. Jon Crowcroft, Mark Handley, Ian Wakeman “Internetworking Multimedia” Harcourt, Singapore, 1998.
4. TayVaughan,“Multimedia Making it to work”, 4th edition Tata McGraw Hill, NewDelhi, 2000.
3. Leon Garcia and Widjaja ,“ Communication networks: Fundamental concepts and key architectures”, McGraw Hill, Inc., NY, USA, 2006
4. Jean Walrand , “ Communication networks”, McGraw Hill, Inc., NY, USA, 1998.

Internal Continuous Assessment: 40 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC7247	MARKOV MODELING AND QUEUEING THEORY	3-0-0-3	2015

Objective:

- To provide a thorough treatment of Markov chains and Markov models of systems.
- To deals with the essential queuing theory and application of Markov models in the analysis of queuing networks.

Syllabus

Stochastic Processes, Markov Models, Single Class &Multi-class Queuing Networks and Time Delays and Blocking in Queuing Networks

OUTCOMES

The students would be able to

- Practice with markov chains and markov model of systems
- Understand the necessity of queuing theory and its applications

Course Plan

Module	Contents	Hours	Sem Exam Marks (%)
Module 1	**Stochastic Processes:** Renewal Processes- Reward and Cost Models, Poisson Process; Point Processes; Regenerative Processes; Renewal Theorems.	**10**	**25**
Module 2	**Markov Models:** Discrete Time Markov Chain- Transition Probabilities, Communication Classes, Irreducible Chains; Continuous Time Markov Chain -	**6**	**13**
	FIRST INTERNAL TEST		
Module 2	Pure-Jump Continuous-Time Chains, Regular Chains, Birth and Death Process, Semi-Markov Processes.	**6**	**12**
Module3	**Single Class &Multi-class Queuing Networks:** Simple Markovian queues; M/G/1 queue; G/G/1 queue; Open queuing networks; Closed queuing networks; Mean value analysis; Multi-class traffic model; Service time distributions; BCMP networks; Priority systems.	**10**	**25**
	SECOND INTERNAL TEST		
Module 4	**Time Delays and Blocking in Queuing Networks:** Time delays in single server queue; Time delays in networks of queues; Types of Blocking; Two finite queues in a closed network; Aggregating Markovian states.	**10**	**25**
	END SEMESTER EXAM		

	Total Hours	**42**	

REFERENCES:

1. Ronald W. Wolff, Stochastic Modeling and The Theory of Queues, Prentice-Hall International.

2.PeterG. Harrison and NareshM. Patel, Performance Modeling of Communication Networks and Computer Architectures, Addison-Wesley.

3.GaryN. Higgin bottom, Performance Evaluation of Communication Networks, ArtechHouse.

4.AnuragKumar, D. Manjunath, and JoyKuri, Communication Networking: An Analytical approach, MorganKaufmanPubl.

5. D. Bertsekas and R. Gallager, Data Networks,PrenticeHallofIndia.

6. Ross, K.W., Multiservice Loss Modelsfor Broadband Telecommunication Networks, Springer Verlag.

7.Walrand,J., An Introduction to QueueingNetworks, Prentice Hall.

Internal Continuous Assessment: 40 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC7267	MULTICASTING TECHNIQUES IN MANETs	3-0-0-3	2015

COURSE OBJECTIVES:

- To study the fundamentals of Communication Paradigms in MANETs
- To learn the Modeling and simulation tools for MANETs
- To study the multi cast routing protocols and routing techniques in MANETs

Syllabus

Routing In Manets, Communication Techniques, Multicast Routing Protocol and Implementation and Simulation

OUTCOMES

The students would be able to

- Familiarize with the fundamentals of MANET
- Manage with the modeling and simulation tools
- Understand different protocols

Course Plan

Module	Contents	Hours	Sem Exam Marks (%)
Module 1	**ROUTING IN MANETS** Introduction – Flooding - Classification of Routing Protocols - Study and Performance of Routing Protocols – Routing Modeling and Mathematical Analysis.	**10**	**25**
Module 2	**COMMUNICATION TECHNIQUES** Types of Communication – Multicast vs. Unicast – Scalability – Application of Group Communication –	**6**	**13**
	FIRST INTERNAL TEST		
Module 2	Characteristics of Group – Special Aspects of Group Communication – Support within the Communication System.	**6**	**12**
Module3	**MULTICAST ROUTING PROTOCOL** Introduction – Multicast Protocols in Wired Networks – Multicast routing protocols in mobile ad hoc networks – MAODV, source based tree, core based tree, multicast mehs and location based multicast - multicast Routing Algorithms – protocol Comparisons – issues.	**10**	**25**
	SECOND INTERNAL TEST		
Module 4	**IMPLEMENTATION AND SIMULATION** Introduction – Modeling and Simulation tools for MANETs – Network simulator, Glomosim, Qualnet and Opnet - Calculation of Metrics – Simulation parameters – Simulation Results –	**10**	**25**

	Conclusion		
	END SEMESTER EXAM		
	Total Hours	**42**	

REFERENCES

1. C.K.Toh, “Ad Hoc Mobile Wireless Networks”, Pearson Education, 2002.

2. Ralph Wittmann, Martina Zitterbart.“Multicast Communication: Protocols, Programming, & Applications” ,MorganKaufmann Publishers,2001.

3. C.Siva Ram Murthy and B.Smanoj, “ Ad Hoc Wireless Networks – Architectures and

Protocols”, Pearson Education, 2004

4. George Aggelou, “Mobile Ad hoc Networks from wireless LANS to 4G Networks”, Tata

McGraw-Hill Edition 2009.

5 MounirFrikha, “Ad hoc Networks Routing, Qos and optimization”, Willey publication, 2011.

Internal Continuous Assessment: 40 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC7277	RADAR SIGNAL PROCESSING	3-0-0-3	2015

COURSE OBJECTIVES:

- To understand the Radar Signal acquisition and sampling in multiple domains
- To provide clear instruction in radar DSP basics
- To equip the skills needed in both design and analysis of common radar algorithms
- To understand the basics of synthetic aperture imaging and adaptive array processing

Syllabus

Introduction To Radar Systems , Signal Models, Sampling and Quantization of Pulsed Radar Signals and Radar Waveforms

OUTCOMES

The students would be able to

- Practice with the basics of radar signal acquisition and sampling
- Understand basics of radar DSP and also the design and analysis of radar algorithms

Easily tackle with the synthetic aperture imaging and adaptive array processing

Course Plan

Module	Contents	Hours	Sem Exam Marks (%)
Module 1	**INTRODUCTION TO RADAR SYSTEMS** History and application of radar, basic radar function, elements of pulsed radar, review of signal processing concepts and operations, A preview of basic radar signal processing, radar system components, advanced radar signal processing	**10**	**25**
Module 2	**SIGNAL MODELS** Components of a radar signal, amplitude models, types of clutters, noise model and signal-tonoise ratio,	**6**	**13**
	FIRST INTERNAL TEST		
Module 2	jamming, frequency models: the doppler shift, spatial models, spectral model	**6**	**12**
Module3	**SAMPLING AND QUANTIZATION OF PULSED RADAR SIGNALS** Domains and criteria for sampling radar signals, Sampling in the fast time dimension,Sampling in slow time: selecting the pulse repetition interval, sampling the dopplerspectrum,Sampling in the spatial and angle dimension, Quantization, I/Q Imbalance and Digital I/Q	**10**	**25**
	SECOND INTERNAL TEST		

Module 4	**RADAR WAVEFORMS** Introduction, The waveform matched filter, Matched filtering of moving targets, The ambiguity function, The pulse burst waveform, frequency-modulated pulse compression waveforms, Range sidelobe control for FM waveforms, the stepped frequency waveform, Phase-modulated pulse compression waveforms, COSTAS Frequency Codes.	**10**	**25**
	END SEMESTER EXAM		
	Total Hours	**42**	

REFERENCES:

1. Fundamentals of Radar Signal Processing, Mark A. Richards McGraw-Hill, New York, 2005
2. Principles of Radar and Sonar Signal Processing, Francois Le Chevalier, Artech House
3. Radar systems, Peak Detection and Tracking, Michael O Kolawole ,2010,Elseveir
4. Introduction To Radar Systems 3/E, Skolnik, McGraw Hill.
5. Radar Principles, Peyton Z. Peebles, 2009 Wiley India
6. Radar Design Principles-Signal Processing and the environment, Fred E. Nathanson, PHI

Internal Continuous Assessment: 40 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC7287	VLSI FOR WIRELESS COMMUNICATION	3-0-0-3	2015

COURSE OBJECTIVES:

- Tostudy thedesignconceptsoflownoiseamplifiers.
- Tostudy thevarioustypesofmixersdesignedforwirelesscommunication.
- TostudyanddesignPLLandVCO.

Syllabus

Components and Devices, Mixers, Frequency Synthesizers and Implementations

OUTCOMES

The students would be able to

- Practice with concepts and design of amplifiers and mixers
- Understand the design of PLL and VCO

Course Plan

Module	Contents	Hours	Sem Exam Marks (%)
Module 1	**COMPONENTS AND DEVICES** Integrated inductors, resistors, MOSFET and BJT AMPLIFIER DESIGN: Low Noise Amplifier Design - Wideband LNA - Design Narrowband LNA - Impedance Matching - Automatic Gain Control Amplifiers – Power Amplifier	**10**	**25**
Module 2	**MIXERS** Balancing Mixer - Qualitative Description of the Gilbert Mixer - Conversion Gain – Distortion – Low Frequency Case: Analysis of Gilbert Mixer – Distortion - High-Frequency Case – Noise – A Complete Active Mixer. Switching Mixer - Distortion in Unbalanced Switching Mixer – Conversion Gain in Unbalanced Switching Mixer - Noise in Unbalanced Switching Mixer	**6**	**13**
	FIRST INTERNAL TEST		
Module 2	A Practical Unbalanced Switching Mixer.Sampling Mixer - Conversion Gain in Single Ended Sampling Mixer - Distortion in Single Ended Sampling Mixer - Intrinsic Noise in Single Ended Sampling Mixer - Extrinsic Noise in Single Ended Sampling Mixer.	**6**	**12**
Module3	**FREQUENCY SYNTHESIZERS** Phase Locked Loops - Voltage Controlled Oscillators - Phase Detector – Analog Phase Detectors – Digital Phase Detectors - Frequency Dividers - LC Oscillators - Ring Oscillators - Phase Noise - A Complete Synthesizer Design Example (DECT Application).	**10**	**25**
	SECOND INTERNAL TEST		

Module 4	**IMPLEMENTATIONS** VLSI architecture for Multitier Wireless System - Hardware Design Issues for a Next generation CDMA System .	**10**	**25**
	END SEMESTER EXAM		
	Total Hours	**42**	

REFERENCES:

1. B.Razavi ,"RF Microelectronics" , Prentice-Hall ,1998.
2. Bosco H Leung "VLSI for Wireless Communication", Pearson Education, 2002.
3. Thomas H.Lee, "The Design of CMOS Radio –Frequency Integrated Circuits', Cambridge University Press ,2003.
4. Emad N Farag and Mohamed I Elmasry, "Mixed Signal VLSI Wireless Design - Circuits and Systems", Kluwer Academic Publishers, 2000.
5. BehzadRazavi, "Design of Analog CMOS Integrated Circuits" McGraw-Hill, 1999.
6. J. Crols and M. Steyaert, "CMOS Wireless Transceiver Design," Boston, Kluwer Academic Pub., 1997.

Internal Continuous Assessment: 40 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC7297	WIRELESS SENSOR NETWORKS	3-0-0-3	2015

COURSE OBJECTIVES:

- To review the architecture of WSN
- To study the various protocols layers of WSN
- To study the establishment of WS Ninfrastructure

Syllabus

Introduction ,MAC Protocols for WSN,Routing Protocols for WSN and Transport Control Protocols for WSN

OUTCOMES

The students would be able to

- Familiarize with the architecture of WSN and its protocols
- Manage with different protocol layers and the WSN architecture establishment\

Course Plan

Module	Contents	Hours	Sem Exam Marks (%)
Module 1	**INTRODUCTION** Architectural Elements, Basic Technology, Sensor Node, Hardware and Software, Sensor Taxonomy, Design challenges, Characteristics and requirements of WSNs, Applications.	**10**	**25**
Module 2	**MAC PROTOCOLS FOR WSN** Fundamentals of MAC Protocols, Performance Requirements, Common Protocols, MAC for WSN, Schedule based protocols,	**6**	**13**
	FIRST INTERNAL TEST		
Module 2	Random Access based Protocols, Sensor-MAC, IEEE802.15.4 LRWPAN's Standard	**6**	**12**
Module3	**ROUTING PROTOCOLS FOR WSN** Data Dissemination and Gathering, Challenges and Design Issues, Network Scale and Time-Varying Characteristics, Routing Strategies, Flooding and it's **vari**ants.	**10**	**25**
	SECOND INTERNAL TEST		
Module 4	**TRANSPORT CONTROL PROTOCOLS FOR WSN** Design Issues, Congestion Detection and Avoidance, Event-to-Sink Reliable Transport, Reliable Multi segment Transport; Pump Slowly, Fetch Quickly, GARUDA, ATP, Congestion and Packet Loss	**10**	**25**

	Recovery.		
	END SEMESTER EXAM		
	Total Hours	**42**	

REFERENCES

1. K. Sohraby, Minoli, and T.Znati ," Wireless Sensor Networks: Technology, Protocols, and Applications", John Wiley & Sons, March 2007.
2. H. Karl and A. Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley & Sons, October 2007.
3. C.S. Raghavendra, K.M. Sivalingam, and T. Zanti ,"Wireless Sensor Networks" Editors, Springer Verlag, Sep. 2006.
4. E.H. Callaway, Jr. Auerbach ,"Wireless Sensor Networks: Architectures and Protocols", Aug. 2003.

Internal Continuous Assessment: 40 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to the students, right at the beginning of the semester by the teacher.

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC7263	SEMINAR	0-0-2-2	2015

Objective:

- To assess the debating capability of the student to present a technical ltopic.
- Toimpart training to a student to face audience and present his/her ideas and thus creating self esteem and courage that are essential for an engineer.

OUTCOMES

The students would be able to

- Manage with the debating capability and presentation of a technical topic
- Understand the basic nature of the presentation

Instructions:

- Individual students are required to choose a topic of the interest preferably from outside the M.Techsyllabus and give a seminar on that topic about 45minutes.
- A committee consisting of at least three faculty members shall assess the presentation of the seminar and award marks to the students based on merits of topic of representation.
- Each student shall submit two copies of a write up of the seminar topic.
- One copy shall be returned to the student after duly certifying it by the chairman of the assessing committee and the other will be kept in the departmental library.
- Internal continuous assessment marks areawarded based on the relevance of the topic, presentation skill, quality of the report and participation

InternalContinuousAssessment(MaximumMarks-100)

Presentation +Discussion : 60
Relevance + Literature : 10
Report : 20
Participation : 10

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC7283	MASTERS RESEARCH PROJECT (PHASE – I)	0-0-12-6	2015

Objective:

- To improve the professional competency and research aptitude by touching the areas which otherwise not covered by theory or laboratory classes.
- To develop the work practice in students to apply theoretical and practical tools/techniques to solve real life problems related to industry and current research.

OUTCOMES

The students would be able to

- Practice with the research aptitude and manage with different topics in the field
- Understand the necessities in the field

Instructions

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- The student is required to undertake the masters research project phase-I during the third semester and the same is continued in the 4th semester.(Phase-II).
- Phase-I consists of preliminary thesis work, two reviews of the work and the submission of preliminary report.
- First review would highlight the topic, objectives, methodology and expected results.
- Second review evaluates the progress of the work, preliminary report and scope of the work which is to be completed in the 4th semester.
- The project work can be a design project / experimental project and or computer simulation project on communication engineering or any of the topics related with communication engineering stream.
- The project work is allotted individually on different topics.
- The students shall be encouraged to do their project work in the parent institute itself.
- If found essential, they may be permitted to continue their project outside the parent institute .
- Department will constitute an Evaluation Committee to review the project work.
- The Evaluation committee consists of at least three faculty members of which internal guide and another expert in the specified area of the project shall be two essential members

InternalContinuousAssessment(MaximumMarks-100)

First review:

Guide -20 marks
Evaluation committee -30 marks

Second review:

Guide- 20 marks
Evaluation committee- 30 marks

SEMESTER – IV

Course No	Course Name	L-T-P-Credits	Year of Introduction
09EC7284	MASTERS RESEARCH PROJECT (PHASE - II)	0-0-21-12	2015

COURSE OBJECTIVES:

- To improve the professional competency and research aptitude by touching the areas which otherwise not covered by theory or laboratory classes.
- To develop the work practice in students to apply theoretical and practical tools/techniques to solve real life problems related to industry and current research

OUTCOMES

The students would be able to

- Familiarize with the applications in the field and the experience of using the technical tools
- Understand the necessity of the field

Instructions:

- Masters Research project phase-II is a continuation of project phase-I started in the third semester.
- Before the end of the fourth semester, there will be two reviews, one at middle of the fourth semester and other towards the end.
- In the first review, progress of the project work done is to be assessed.
- In the second review, the complete assessment (quality, quantum and authenticity) of the thesis is to be evaluated.
- Both the reviews should be conducted by guide and Evaluation committee.
- This would be a pre qualifying exercise for the students for getting approval for the submission of the thesis.
- At least one technical paper is to be prepared for possible publication in National/International journal or conferences.
- The technical paper is to be submitted along with the thesis.

Internal Continuous Assessment(MaximumMarks-100)

First review:

Guide -20 marks
Evaluation committee -30 marks

Second review:

Guide- 20 marks
Evaluation committee -30 marks