PARUL UNIVERSITY-FACULTY OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

(M. TECH. – ELECTRONICS & COMMUNICATION ENGINEERING)

SYLLABUS FOR 2nd SEM M. TECH. PROGRAMME

INFORMATION THEORY & CODING (SUBJECT CODE: 03204151)

ACADEMIC YEAR 2015-16

Type of Course: Electronics & Communication Engineering (PG)

Prerequisite: The student should possess good understanding of Probability and elementary enumerating principles, Linear Algebra, and Calculus.

Rationale: PG Students of EC Engineering need to possess good understanding of the fundamentals and applications of digital communication system. The course presents in detail the theory and practice of efficient storage and transmission of information over noisy channels. They are expected to be able to design efficient error correcting codes. Theory concepts of source coding, error detecting and correcting schemes, their encoding and decoding process, cryptography will be verified through implementation in MATLAB and Simulink.

Teaching and Examination Scheme:

Teaching Scheme (Hrs/Week)			Cr	Examination Scheme				Total
				External		Internal		
L	T	P		TH (E)	PRA(V)	Mid Exam (M)	P.A. (I)	
2	0	2	4	60	30	40	20	150

L- Lectures; **T**- Tutorial/Teacher Guided Student Activity; **P- Practical**; **Cr**- Credit; **E -** End Semester Theo. Exam; **V -** End Semester Viva Exam; **M –** Mid Semester Exam; **P.A.**- Progressive Assessment

Contents:

Sr. No.	Topic	Weightage	Teaching Hrs.
1.	**Basic concept of coding:** Unique decodable codes, instantaneous decodable codes (IDC), Construction of IDC, Krafts inequality and MC Millan's theorem, Huffman and Shannon - fano code.	15%	07
2.	**Entropy, Entropy of sources and their extension:** Entropy of sources and their extension, Loss less image compression, JPEG standard: application of entropy coding	15%	06
3.	**Data compression model and Loss less compression:** Types of redundancies, Coding, Arithmetic coding and decoding.	10%	04
4.	**Channel Coding:** Introduction of Channel coding, Reliable Communication through Unreliable channels, Information rates, Hamming Distance, Correction and Detection of errors, Channel capacity, relationship of channel capacity with mutual information, Shanon fano Theorem.	20%	12
5.	**Linear block codes:** Generator matrix, Parity check matrix, Syndrome, Detection and corrections of errors, Syndrome decoding on symmetric channels, Cyclic Codes-Generator polynomials, Encoding cyclic codes, Parity check polynomials, Decoding cyclic codes.	15%	07
6.	**Convolution Codes:** Introduction, An (n,k) convolution code, Code tree, The Viterbi decoding algorithm, Trellis diagram, BCH codes, Reed-Solomon codes, Hamming codes.	15%	07
5.	**Cryptography:** Introduction to Cryptography, Secret Key Encryption, Public Key Encryption, Encryption based on large Prime Numbers, Encryption based on Knapsack Problem, Data Encryption Standard.	10%	05

Reference Books:

1. Foundation of coding by Jiri Adamek, John Wiley and sons.

2. Principal of Digital Communication and Coding by A.J. Viterbi and J.K.Ormura, McGraw Hill
3. Digital communication fundamental and Application by Bernard Sklar, PE India.
4. Information and Coding by N. Abramson, McGraw Hill,1963
5. Introduction to Information Theory by M Mansurpur, McGraw Hill, 1987
6. Information Theory by R.B.Ash, Prentice Hall, 1970
7. Error Control Coding by Shu Lin and D.J.Costello Jr., Prentice Hall, 1983

Course Outcome:

After learning the course the students shall be able to:

1. Understand the theoretical principles of source coding.
2. Analyze various error correcting codes.
3. Compare coded Vs. uncoded system.

List of Practical:

Based on Syllabus students shall perform following Practical.

1. Verify Kraft's inequality for binary and ternary codes and generate instantaneous codes.
2. A) Simulate binary Huffman code in MATLAB.
   B) Find average length, entropy and coding efficiency of the code.
3. Write a MATLAB program that takes in channel transition probability matrix and compute Mutual Information & channel capacity of the discrete memory less channel.
4. Write a MATLAB program to encode messages for a forward error correction system with a given Linear block code.
5. Write a MATLAB program to decode the encoded word for a forward error correction system with a given Linear block code.
6. Write a MATLAB program to encode messages for a system with given Cyclic Polynomial code.
7. Decoding the messages for a system with a given cyclic polynomial code and verifying through simulation.
8. Understanding the concept of loss less data compression technique using Huffman coding.
9. Write a MATLAB program to perform BCH encoding and decoding.
10. Write a MATLAB program to perform RS encoding and decoding.
11. Encoding the data bits using a Binary Cyclic block encoder in Simulink.
12. Decoding the code words using a Binary Cyclic block decoder in Simulink.
13. Encoding the data bits using a Binary Linear block encoder in Simulink.
14. Decoding the code words using Binary Linear block decoder in Simulink.
15. Implementation of Cryptography technique in MATLAB.

Project:

Students shall carry outprojects based on theory and practical, either individually or in groups. Following are definitions of some of sample projects.

1. Design an encoder of a binary convolution (3,2) -code of memory m = 2.
2. Design and encoder of the binary convolution (2,1)-code. Encode all three bit massages. Draw the trellis diagram for the same.
3. Design a shift register encoder of the Hamming code of length 15.

Major and Minor Equipments:

1. MATLAB Software

PROJECTS/STUDY REPORTS/LATEST OUTCOMES IN TECHNOLOGY STUDY

*PA (I): 10 marks for Active Learning Assignments, 10 marks for other methods of PA

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding of recent applications and advancement in the telecommunication network and traffic engineering. Every student or a group of students shall critically study papers, integrate the details and make presentation. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the Students of the group, the name of the Faculty, Department and College on the first slide.

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

(M. TECH. – ELECTRONICS & COMMUNICATION ENGINEERING)

SYLLABUS (PROPOSED) FOR 2nd SEM M. TECH. PROGRAMME

ANTENNA SYSTEM DESIGN (SUBJECT CODE: 03204152)

ACADEMIC YEAR 2015-16

Type of Course: Electronics & Communication Engineering (PG)

Prerequisite: Knowledge of Electro-magnetic.

Rationale: Antenna System design knowledge is essential for communication concepts for all Engineers.

Teaching and Examination Scheme:

Teaching Scheme (Hrs/Week)			Cr	Examination Scheme				Total
				External		Internal		
L	T	P		TH (E)	PRA(V)	Mid Exam (M)	P.A. (I)	
3	0	2	5	60	30	40	20	150

L- Lectures; **T**- Tutorial/Teacher Guided Student Activity; **P- Practical**; **Cr**- Credit; **E -** End Semester Theo. Exam; **V -** End Semester Viva Exam; **M –** Mid Semester Exam; **P.A.**- Progressive Assessment

Contents:

Sr. No.	Topic	Weightage	Teaching Hrs.
1.	**Review of Antenna Theory:** Reciprocity theorem, Antenna equivalent circuit, Classification of antennas, Special types of Antennas for different frequency bands.	05%	02
2.	**Antenna Parameters:** Radiation Impedance, Radiation Pattern, Antenna Impedance, Bandwidth, Directivity, Gain, Antenna efficiency, Radiation Efficiency, Antenna Polarization, Antenna Apertures, Antenna temperature, Near-field and far-field concepts and radiation mechanism.	05%	02
3.	**Arrays: Linear, Planar, and Circular**: Two-Element Array N-Element Linear Array: Uniform Amplitude and Spacing N Element Linear Array, Directivity Design Procedure, N Element Linear Array, Three-Dimensional Characteristics Rectangular-to-Polar Graphical Solution, N-Element Linear Array: Uniform Spacing, Non uniform, Binomial Array Amplitude, Planar and Circular Arrays.	20%	12
4.	**Antenna synthesis:** Schelkunoff Polynomial, Fourier transform, Woodward Lawson, Dolph-Chebyshev, Triangular, Cosine, Cosine-Squared Amplitude Distributions	20%	10
5.	**Microstrip Antennas**: Multi Band, Recent advances in fractal antenna and patch array, Applications in Wireless and Satellite communication.	10%	04
6.	**Horn and Reflector antenna:** Rectangular Horn (Pyramidal), Circular Aperture Horn, Circular (Conical) Corrugated Horn, Paraboloidal Reflector Geometry, Dual Reflector Antennas and feeds, Spherical Reflector, Shaped Reflectors.	10%	05
7.	**Phased arrays:** Fixed Phase Shifters or Phasers, Non-uniform and Random Element Existence Arrays, Feed Networks, Adaptive Antenna & Digital beam forming, smart antenna for wireless communication.	10%	05
8.	**Antenna Analysis:** Integral equation method, Moment method, Finite Difference Time Domain methods.	10%	04
9.	**Antenna Optimization Techniques:**	10%	04

Sr. No.	Topic	Weightage	Teaching Hrs.
	Genetic algorithm, Artificial Intelligence, Comparative analysis of the OT's for particular application and antenna type.		

Reference Books:

1. Antenna Theory, Analysis and design by Balanis C A, Wiley.
2. Antennas by J. D. Krauss, McGraw Hill.
3. Antenna Engineering Handbooks by Hohnson R C and H Jasik, McGraw Hill
4. Fields and waves in communication electronics by Ramo, Whinnery, John Wiley
5. Antenna Theory and Design by Robert Stratman Elliott, Prentice-Hall, 1981
6. Microwave Horns and Feeds by A. David Olver, IEEE Press
7. Reflector antennas by Allan Walter Love, IEEE Antennas and Propagation Society
8. Electromagnetic Horn Antennas by A.W. Love, IEEE press

Course Outcome:

After learning the course the students shall be able to:

1. Understand the concept of Antenna Parameters.
2. Understand the concept of linear array antennas and their synthesis.
3. Understand the recent trends in Microstrip patch antenna.
4. Understand the concept of reflector antenna and horn antenna.
5. Understand the concept of different optimization techniques and comparative study on that.
6. Design the antenna and simulate it by using software and analyses various parameters.
7. Compare the various parameters of antennas by using the mathematical expression derived by various electromagnetic modeling techniques.

List of Practical:

Based on Syllabus students shall perform following Practical.

1. To plot the radiation pattern of simple lambda by two antenna.
2. To plot the radiation pattern of folded lambda by two antenna.
3. To plot the radiation pattern of 7 element yagi uda antenna.
4. To plot the radiation pattern of Microstrip Patch antenna.
5. To plot the radiation pattern of Slot antenna.
6. To plot the radiation pattern of Phased array antenna.
7. To plot the radiation pattern of Loop antenna.
8. To plot the radiation pattern of helical antenna.
9. To plot the radiation pattern of Horn antenna.
10. To plot the radiation pattern of Log Periodic antenna.
11. To study about reciprocity theorem.

Project:

Students shall carry outprojects based on theory and practical, either individually or in groups. Following are definitions of some of sample projects.

1. To analyze the charge distribution by using the method of moment and finite element method by MATLAB.
2. To design fractal antenna by using CST software and analyze the various parameters.
3. To design patch antenna array by using the CST software and analyze return loss, radiation pattern, polarization, directivity etc.
4. To design linear array antenna using different optimization techniques and compare their results.
5. To design quadric-filler helical antenna using HFSS software.

Major and Minor Equipments:

1. MATLAB
2. HFSS
3. CST Microwave Studio
4. Antenna Trainer kit : Scientech-ST 22614A

PROJECTS/STUDY REPORTS/LATEST OUTCOMES IN TECHNOLOGY STUDY

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

(M. TECH. – ELECTRONICS & COMMUNICATION ENGINEERING)

SYLLABUS (PROPOSED) FOR 2nd SEM M. TECH. PROGRAMME

ADVANCED DIGITAL COMMUNICATION (SUBJECT CODE: 03204153)

ACADEMIC YEAR 2015-16

Type of Course: Electronics and Communication Engineering (PG)

Prerequisite: Knowledge of Signals and Systems, Probability and Random Processes.

Rationale: Basic Signal Analysis and Probability Theory knowledge is essential for senior level undergraduate and postgraduate students.

Teaching and Examination Scheme:

Teaching Scheme (Hrs/Week)			Cr	Examination Scheme				Total
				External		Internal		
L	T	P		TH (E)	PRA(V)	Mid Exam (M)	P.A. (I)	
3	0	2	5	60	30	40	20	150

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Contents:

Sr. No.	Topic	Weightage	Teaching Hrs.
1.	**Introduction and Representation of Signals:** Digital communication system (In detail all modules of Block diagram), Complex baseband representation of signals, Gram-Schmidt orthogonalization procedure, M-ary orthogonal signals, bi-orthogonal signals.	15%	07
2.	**Review of probability and Stochastic Processes:** Review of probability and Stochastic Processes.	05%	03
3.	**Modulation Techniques:** Pulse amplitude modulation (binary and M-ary, QAM), Pulse position modulation (binary and M-ary), Carrier modulation (M-ary ASK, PSK, FSK, DPSK), Continuous phase modulation (QPSK and variants, MSK, GMSK).	20%	10
4.	**Receiver in additive white Gaussian noise channels:** Coherent and noncoherent demodulation: Matched filter, Correlator demodulator, Square-law and envelope detection, Optimum rule for ML and MAP detection Performance.	20%	10
5.	**Band-limited channels:** Pulse shape design for channels with ISI: Nyquist pulse, Partial response signaling (duobinary and modified duobinary pulses), Demodulation of Channel with distortion: Design of transmitting and receiving filters for a known channel and for time varying channel (equalization), Performance: Symbol by symbol detection and BER, symbol and sequence detection, Viterbi algorithm, Synchronization Techniques (Early-Late Gate, MMSE, ML and spectral line methods).	25%	12
6.	**Fading over multipath channel:** Characteristics of fading channels, Rayleigh and Rician channels, Amount of fading and average bit/symbol error rate, Receiver performance-average SNR, OFDM and future trends.	15%	06

Reference Books:

1. Fundamentals of Communication Systems by J. G. Proakis and M. Salehi, Pearson Education, 2005.
2. Detection Estimation and Modulation Theory by Van Trees H.L., Wiley.
3. Advanced Electronic Communication Systems by W. Tomasi, 4th Ed., Pearson Education, 1998.

4. Digital Communication over Fading Channels by M. K. Simon and M. S. Alouini, ohn Wiley & Sons 2000.
5. Communication System by Carison A., McGraw Hill Publication.

Course Outcome:

After learning the course the students shall be:

1. Able to understand the concept of fundamental techniques of signal representation and signal transmission.
2. Able to analyze the reception of communication system related signals applicable for a wide range of communication applications.

List of Practical:

Based on Syllabus students shall perform following Practical.

1. To represent band pass signal into equivalent low pass signal.
2. Simulates a binary communication system with orthogonal signal waveforms.
3. To plot Constellation of 16 –QAM and compare theoretical symbol SER with the SER of root raised cosine filter.
4. To compare Bit Error Rate of M-QAM for different values of M.
5. To simulate Digital Communication system with Coherent FSK signal.
6. Plot the theoretical and practical BER for Non-coherent FSK detection.
7. Simulate a PLL with loop filter using MATLAB.
8. Simulate a QAM system with Decision-feedback Carrier Recovery in MATLAB.
9. Simulates a QPSK system with a carrier phase recovery using recursive Costas loop.
10. Simulate a PLL with squaring loop using MATLAB.
11. Implementation of linear equalization for 16-QAM.
12. To perform OFDM transmission of QAM signals using MATLAB.

Required Softwares:

1. MATLAB

PROJECTS/STUDY REPORTS/LATEST OUTCOMES IN TECHNOLOGY STUDY

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

(M. TECH. – ELECTRONICS & COMMUNICATION ENGINEERING)

SYLLABUS FOR 2nd SEM M. TECH. PROGRAMME

SPEECH PROCESSING (SUBJECT CODE: 03204180)

ACADEMIC YEAR 2015-16

Type of Course: Electronics & Communication Engineering (PG)

Prerequisite: Knowledge of Digital Signal Processing.

Rationale: Electronics Engineer interested in the field of Speech signal Processing.

Teaching and Examination Scheme:

Teaching Scheme (Hrs/Week)			Cr	Examination Scheme				Total
				External		Internal		
L	T	P		TH (E)	PRA(V)	Mid Exam (M)	P.A. (I)	
2	0	2	4	60	30	40	20	150

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Contents:

Sr. No.	Topic	Weightage	Teaching Hrs.
1.	**Introduction to Speech Processing :** Introduction, Fundamentals of Digital Speech Processing: Discrete Time Signals and systems, Transform Representations of Signals and Systems, Fundamentals of Digital Filters, Sampling.	08%	04
2.	**Speech Production and Acoustic phonetics:** Anatomy and physiology of speech organs: Speech sounds and classification, International Phonetic Alphabet. Articulatory Phonetics: Manner of articulation and place of articulation, Phonemes in other languages, Articulatory Models, Acoustic Phonetics, Acoustic characteristics of speech sounds, Practical Vocal tract models for speech analysis and synthesis, coarticulation and prosody.	12%	06
3.	**Time Domain models for speech processing:** Time dependent processing of speech, short-time energy and average magnitude, short-time Zero-Crossing Rate (ZCR), Speech vs. silence discrimination using energy and zero crossings, short-time autocorrelation function, Short-time Average Magnitude Difference Function (AMDF),Pitch Period Estimation.	17%	08
4.	**Frequency Domain Models For Speech Processing:** Short-time Fourier transform (STFT), Design of digital filter banks, Implementation of filter bank summation method using FFT: Analysis & Synthesis Technique, Spectrographic Displays, pitch Detection.	17%	08
5.	**Homomorphic Signal Processing:** Homomorphic systems for convolution: properties of complex cepstrum, computational considerations, Complex cepstrum of voiced speech, complex cepstrum of unvoiced speech, Mel-scale cepstrum, Pitch detection, Formant Estimation.	17%	08
6.	**Linear Predictive Coding of Speech:** Basic principles of Linear predictive analysis: Autocorrelation method and covariance method, Computation of gain for the model, Prediction error signal, frequency domain interpretation of LP analysis, frequency domain interpretation of mean-squared prediction error, comparison to other	17%	08

Sr. No.	Topic	Weightage	Teaching Hrs.
	spectrum analysis methods, applications of LPC parameters.		
7.	**Coding of Speech Signals** : Statistical Models, Scalar Quantization, Vector Quantization, Frequency Domain Coding, Model Based Coding, LPC Residue Coding.	12%	06

Reference Books:

1. Digital Processing of Speech Signals by L. Rabiner and R. Schafer, Pearson Education
2. Speech Communication: Human and machine by D. O'Shaughnessy , University Press
3. Discrete-time Speech Signal Processing by T. Quatieri, Pearson Education
4. Discrete-Time Processing of Speech Signals by Deller J., J. Proakis, and J. Hansen, Wiley-IEEE Press.

Course Outcome:

After learning the course the students shall be able to:

1. Understand the basic scientific principles of speech production.
2. Understand basic mathematical tools needed for speech signal representation, analysis and manipulation.
3. Understand basic algorithms applied to many common applications of speech processing.

List of Practical:

Based on Syllabus students shall perform following Practical.

1. To Study and visualize speech signal for different speakers.
2. Write a program for optimal sampling frequency and optimal bit resolution for speech signal processing.
3. Write a program to understand the difference between stationary and non-stationary signals.
4. Write a program to identify the time and frequency domain characteristics of voiced and unvoiced speech.
5. Write a program to compute short term energy and zero crossing rate of a given Speech Signal.
6. Write a program to compute short term autocorrelation and pitch of given Speech signal.
7. Write a program to plot the STFT of a given speech signal.
8. Write a program for linear predictive coefficients and residue of a given speech signal.
9. To understand basic Cepstral Analysis approach and write a program to perform vocal tract and source information separation by Cepstral Analysis.
10. Write a program for the Cepstrum pitch estimation method.

Project:

Students shall carry out projects based on theory and practical, either individually or in groups. Following are definitions of some of sample projects.

1. Write an algorithm to generate the spectrum of stationary signal. Compute the spectrum of square generated above and write down your observation about the frequency components present in the square wave. Determine whether square wave is stationary or non-stationary.
2. Compare voiced and unvoiced segments of a speech using an algorithm that reads a speech file and plots the waveform, spectrum and autocorrelation sequence of any three voiced and unvoiced segments present in the given speech signal.
3. Write an algorithm to which gives difference between vowels and consonants.
4. Compute the short term energy contour for different window functions of different length.
5. Determine pitch of a given Speech Signal.

Major and Minor Equipments:

1. MATLAB Software
2. Sci-lab Software

PROJECTS/STUDY REPORTS/LATEST OUTCOMES IN TECHNOLOGY STUDY

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

(M. TECH. – ELECTRONICS & COMMUNICATION ENGINEERING)

SYLLABUS FOR 2nd SEM M. TECH. PROGRAMME

VLSI CIRCUITS TESTING & VERIFICATION (SUBJECT CODE: 03204181)

ACADEMIC YEAR 2015-16

Type of Course: Electronics & Communication Engineering (PG)

Prerequisite: Knowledge of Digital System Design.

Rationale: Electronics Engineer interested in the field of the Testing and verification of VLSI Design.

Teaching and Examination Scheme:

Teaching Scheme (Hrs/Week)			Cr	Examination Scheme				Total
				External		Internal		
L	T	P		TH (E)	PRA(V)	Mid Exam (M)	P.A. (I)	
2	0	2	4	60	30	40	20	150

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Contents:

Sr. No.	Topic	Weightage	Teaching Hrs.
1.	**Introduction:** Scope Of Testing And Verification In VLSI Design Process, Issues In Test And Verification Of Complex Chips, Embedded Cores And SOCs.	20%	10
2.	**Fundamentals of VLSI testing:** Introduction: Fault models, Fundamentals of Automatic Test Pattern Generation, Design for Testability, Scan Design, Test Interface And Boundary Scan, System Testing and Test For SOC, Delay Fault Testing.	30%	14
3.	**Testing of Logic And Memories:** System testing and test for SOCs. Test interface and boundary scan, IDDQ testing and Delay fault testing, BIST for testing of logic and memories, Test automation.	20%	10
4.	**Verification:** Design Verification Techniques based on simulation, analytical and formal approaches, Functional Verification, Timing Verification, Formal Verification, Basics of Equivalence Checking and Model Checking, Hardware Emulation.	30%	14

Reference Books:

1. Essentials Of Electronic Testing For Digital, Memory And Mixed-Signal VLSI Circuits by Bushnell M. and Agrawal V. D, Kluwer Academic Publishers, 2000.
2. Introduction To Formal Hardware Verification by Kropf T., Springer Verlag, 2000.
3. Digital Systems Testing And Testable Design by Abramovici M., Breuer M. A. and Friedman A. D., IEEE Press, 1990.
4. System-On-A-Chip Verification-Methodology And Techniques by Rashinkar P., Paterson and Singh L., Kluwer Academic Publishers, 2001.
5. Principles Of CMOS VLSI Design by Neil H. E. Weste and David Harris, Addison Wesley, 3rd Edition, 2004.
6. Principles of Testing Electronic Systems by Samiha Mourad and Yervant Zorian, Wiley-2000.
7. Verification Techniques for System-Level Design by M. Fujita, I. Ghosh, and M.Prasad, Morgan Kaufmann Publisher, 2005.

Course Outcome:

After learning the course the students shall be able to:

1. Understand the concept of VLSI Design Process.
2. Analyze a system to embed fault- tolerant techniques.
3. Perform testing and verification of System-Level Design.

List of Practical:
Based on Syllabus students shall perform following Practical.

1. Introduction to Testing & Verification Tolls
2. Study of Concept of Verification Environment and its component by preparing an exhaustive test bench for all Basic Logic Gates.
3. Study of Concept of Verification Environment and its component by preparing an exhaustive test bench for Adder Circuit
4. Study of Concept of Verification Environment and its component by preparing an exhaustive test bench for Multiplexer.
5. To verify sequential circuits like Flip-Flops with the test bench.
6. To verify sequential circuits like Counter with the test bench.
7. To verify sequential circuits like 3 to 8 Decoder with the test bench.
8. To prepare a complete test vector set for all stuck at faults in any one of the following systems:
    - Two bit adder
    - Two bit parity generator
    - 2:1 Multiplexer
9. To create an exhaustive test bench with generator, checker and golden reference model for Arithmetic Logic Unit (ALU).
10. Mini project.

Project:
Students shall carry out projects based on theory and practical, either individually or in groups. Following are definitions of some of sample projects.

1. Design 4-BIT Binary to Gray Code Converter.
2. Design Full-Adder Circuit using Structural method.
3. Design 8 X 1 MUX using Structural method.
4. Design 3 X 8 Decoder using Behavioral method.
5. Design JK Flip-Flop.
6. Design 2 X 4 Decoder using Data-Flow method.

Major and Minor Equipments:

1. CAD Tool
2. Xilinx
3. ModelSim

PROJECTS/STUDY REPORTS/LATEST OUTCOMES IN TECHNOLOGY STUDY

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SYLLABUS FOR 2nd SEM M. TECH. PROGRAMME

INDUSTRIAL CONTROL AND INTERFACES (SUBJECT CODE: 03204182)

ACADEMIC YEAR 2015-16

Type of Course: Electronics & Communication Engineering (PG)

Prerequisite: Knowledge of Controller and Interfacing at UG level.

Rationale: The course provides introductory treatment of the field of Industrial control and its interfaces for engineers.

Teaching and Examination Scheme:

Teaching Scheme (Hrs/Week)			Cr	Examination Scheme				Total
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Contents:

Sr. No.	Topic	Weightage	Teaching Hrs.
1.	**Bus system:** Bus systems in microcomputers ST 100 bus, Multi bus, EISA, PCI Bus, HP IB/GPIB Bus, Bus and their applications. I/O	10%	05
2.	**Interface:** Standard I/O interfaces RS-232 C, RS-232 D Centronics interface, current loop Interface, and RS-449 communication interface, Modbus Protocol, Profibus Protocol.	10%	05
3.	**Design Criterion with PCs:** Application of PC buses (ISA, EISA, PCI, VESA-VL) and associated signals, Handshakes, I/O and Interrupt map, Programming methodology for input/output application, GPIB signals and GPIB programming techniques operating system calls.	20%	10
4.	**Peripherals:** Peripherals like CRT controller, Communication controllers, Programmable keyboard/Display interfaces and Associated circuitries.	25%	12
5.	**Controllers:** PID controllers, Fuzzy Control, Programmable logic controllers, PC based data acquisition system, Interfacing PC to various cards- Stepper motor milli volts & milliamps.	25%	12
6.	**Development Tools:** Microprocessor development system, cross compilers, Simulator In circuit emulators, Automated test equipments etc.	10%	04

Reference Books:

1. Intelligent Instrumentation by George C. Barney, PHI.
2. Student Reference Manual For Electronics Instrumentation Labs by Stanley wolf and Richard F.M. Smith, PHI.
3. Instrumentation for Engg. Measurement by James W. dally, William F. Riley, John Wilay and Sons.
4. Interfacing A Laboratory Approach by Deonzo, PHI.
5. Related IEEE/IEE publications.

Course Outcome:

After learning the course the students shall be able to:

1. Understand the concept of industrial control and applications.
2. Understand various interfaces and protocols.

Major and Minor Equipments:

1. Regulated Power Supplies (Single and Dual)
2. C.R.O/D.S.O
3. Function generator
4. Digital multimeter
5. Micro-controller/ Processor Kits and its interfaces.
6. Microcontroller IDE (Keil / CCS)
7. MATLAB Software

PROJECTS/STUDY REPORTS/LATEST OUTCOMES IN TECHNOLOGY STUDY

*PA (I): 10 marks for Active Learning Assignments, 10 marks for other methods of PA

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding of recent applications and advancement in the telecommunication network and traffic engineering. Every student or a group of students shall critically study papers, integrate the details and make presentation. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the Students of the group, the name of the Faculty, Department and College on the first slide.

PARUL UNIVERSITY-FACULTY OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

(M. TECH. – ELECTRONICS & COMMUNICATION ENGINEERING)

SYLLABUS FOR 2nd SEM M. TECH. PROGRAMME

RF CIRCUIT DESIGN (SUBJECT CODE: 03204183)

ACADEMIC YEAR 2015-16

Type of Course: Electronics & Communication Engineering (PG)

Prerequisite: Knowledge of Electromagnetic at UG level.

Rationale: RF Circuit Design is essential for designing Filter and power amplifier.

Teaching and Examination Scheme:

Teaching Scheme (Hrs/Week)			Cr	Examination Scheme				Total
				External		Internal		
L	T	P		TH (E)	PRA(V)	Mid Exam (M)	P.A. (I)	
2	0	2	4	60	30	40	20	150

L- Lectures; **T**- Tutorial/Teacher Guided Student Activity; **P- Practical**; **Cr**- Credit; **E -** End Semester Theo. Exam; **V -** End Semester Viva Exam; **M –** Mid Semester Exam; **P.A.**- Progressive Assessment

Contents:

Sr. No.	Topic	Weightage	Teaching Hrs.
1.	**Components:** Wire, resistor, capacitor, inductor, toroids,toroidal inductor design, practical winding	05%	02
2.	**Resonant circuit:** Resonance (Lossless Components), Loaded Q, Insertion Loss, Impedance Transformation, Coupling of Resonant Circuits	10%	04
3.	**Filter design:** Modem Filter Design, Normalization and the Low-Pass Prototype, Filter Types, Frequency and Impedance Scaling, High-Pass Filter Design, The Dual Network, Band pass Filter Design, Design Procedure, Band-Rejection Filter Design The Effects of Finite Q	25%	12
4.	**Impedance Matching:** The L network, dealing with complex loads, three-element Matching, Low-Q or Wideband matching networks, The smith chart, impedance Matching on the smith chart	10%	04
5.	**The transistor radio frequencies:** The transistor equivalent circuit, **Y-**parameters, **S-**parameters	05%	02
6.	**Small-signal RF amplifier design & RF Power amplifier:** Transistor biasing, design using y parameters, design using s parameters, RF power transistor characteristics, transistor biasing, power amplifier design, Matching to coaxial feed lines, automatic shutdown circuitry, broadband transformers	20%	12
7.	**RF Receiver and Transmitter System Parameters:** Noise figure, Sensitivity, Selectivity, spurious performance, dynamic range, 1dB Compression, IP3, transmitted power, frequency stability, phase noise, ACPR, unwanted emissions, antenna considerations	15%	08
8.	**Oscillators and Mixers:** Basic Oscillator Model, High Frequency Oscillator Configuration, Basic Characteristics of Mixers.	10%	04

Reference Books:

1. RF Circuit Design by Reinhold Ludwig, Pavel Bretchko, Pearson Education Asia
2. RF Microelectronics by Behzad Razavi, Pearson Education,2nd edition
3. RF Circuit Design by Chris Bowick, Newnes Publication.
4. Microwave Engineering by David M Pozar, Wiley Publication

Course Outcome:

After learning the course the students shall be able to:

1. Understand the concept of RF components and resonant circuits.
2. Understand the filter designing, Oscillators and RF amplifiers.
3. Understand the concept of different parameters of two port network.

List of Practical:

Based on Syllabus students shall perform following Practical.

1. Introduction and study of the Spectrum Analyser and analysis of signal harmonics.
2. To design and simulate Passive Band-Stop Circuit with Load.
3. To design and simulate The Passive Band-Pass Filter.
4. To design and simulate Low Pass and High Pass Filter.
5. To design and simulate The Phase Shift Oscillator.
6. To design and simulate The Hartley Oscillator.
7. To design and simulate The Colpitts Oscillator.
8. To design and analyse DC and AC Operating Point of an RF Amplifier.
9. To obtain S-Parameters in a Two Port Network.
10. To demonstrate the characteristics of Impedance Matching.

Project:

Students shall carry out projects based on theory and practical, either individually or in groups. Following are definitions of some of sample projects.

1. Design, fabrication and testing of Class A RF Power Amplifier.
2. Design, fabrication and testing of Class B RF Power Amplifier.
3. Design, fabrication and testing of Class C RF Power Amplifier.
4. Design, fabrication and testing of Colpitts Oscillator.
5. Design, fabrication and testing of Clapp Oscillator.

Major and Minor Equipments:

1. Multisim
2. LabView
3. PSpice

PROJECTS/STUDY REPORTS/LATEST OUTCOMES IN TECHNOLOGY STUDY

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(M. TECH. – ELECTRONICS & COMMUNICATION ENGINEERING)

SYLLABUS FOR 2nd SEM M. TECH. PROGRAMME

OPTIMIZATION TECHNIQUES (SUBJECT CODE: 03204184)

ACADEMIC YEAR 2015-16

Type of Course: Electronics & Communication Engineering (PG)

Prerequisite: Advanced knowledge of Mathematics up to UG level.

Rationale: Optimization techniques are required for all engineering problems.

Teaching and Examination Scheme:

Teaching Scheme (Hrs/Week)			Cr	Examination Scheme				Total
				External		Internal		
L	T	P		TH (E)	PRA(V)	Mid Exam (M)	P.A. (I)	
2	0	2	4	60	30	40	20	150

L- Lectures; **T**- Tutorial/Teacher Guided Student Activity; **P- Practical**; **Cr**- Credit; **E -** End Semester Theo. Exam; **V -** End Semester Viva Exam; **M –** Mid Semester Exam; **P.A.**- Progressive Assessment

Contents:

Sr. No.	Topic	Weightage	Teaching Hrs.
1.	**Introduction To Optimization:** Development- Engineering application-statement of an optimization problem-classification of problems-optimization techniques. Classical optimization technique- Introduction- single variable and multivariable with no constraints and equality constraints – Lagrange model-optimization with inequality constraints.	25%	12
2.	**Linear Programming Technique:** Simplex method-Dual simplex, Revised simplex, sensitivity analysis - Interial approach of Dikin Quadratic programming and linear complementary problem. Special cases in linear programming.	15%	06
3.	**Non-linear Programming Problems:** General non-linear programming problems; convex, quasi-convex, concave and unimodal functions, Theory of unconstrained optimization-Necessary and sufficient conditions for extrema, Theory of constrained optimization-Lagrange multipliers and Lagrangian optimization, Inequality constraints, Kuhn-Tucker conditions.	15%	06
4.	**Algorithm for Unconstrained Optimization:** Fibonacci search method, Newton-Raphson method, Cauchy's (Steepest descent) method.	10%	06
5.	**Algorithms for Constrained Optimization:** Penalty function methods, Frank-Wolfe method, Gradient project method.	10%	06
6.	**Stochastic Programming** Linear, Non-linear and Geometric programming, Stochastic dynamic programming-Dynamic programming-Introduction, multi-decision problems, concept of sub optimization, principle of optimality, computational procedure, Calculus method of solution, tabular method of solution, Linear programming as a case of dynamic of programming – continuous dynamic programming.	25%	12

Reference Books:

1. Optimization for engineering design by Kalyanmoy deb. , PHI Learning Pvt. Ltd.
2. Optimization concepts and application by Belegundu and Chandraputla; Tata McGraw Hill Publication New

Delhi
3. Engineering optimization –Theory and Practice by S.S.Rao. Pearson, Prentice Hall.

Course Outcome:

After learning the course the students shall be able to:

1. Understand the concept of optimization for various engineering problems.
2. Understand various algorithms for Optimizations.

List of Practical:

Based on Syllabus students shall perform following Practical.

1. Study method to Formulate problem for Optimization.
2. Study to formulate problem with and without constraints and selections of optimization algorithm.
3. Write program to optimize problem using simplex and dual simplex of the Linear Programming method.
4. Write program to optimize problem using Dikin Quadratic programming method.
5. Write program using Lagrangian optimization method.
6. Write program using Fibonacci search method for optimization.
7. Write program using Newton-Raphson method for optimization.
8. Write program using Cauchy's (Steepest descent) optimization method.
9. Write program using Penalty function methods for optimization.
10. Write program using Calculus method of solution for optimization.

Major and Minor Equipments:

1. MATLAB
2. C/C++

PROJECTS/STUDY REPORTS/LATEST OUTCOMES IN TECHNOLOGY STUDY

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SYLLABUS FOR 2nd SEM M. TECH. PROGRAMME

ADHOC NETWORK (SUBJECT CODE: 03204185)

ACADEMIC YEAR 2015-16

Type of Course: Electronics & Communication Engineering (PG)

Prerequisite: Knowledge of computer networking, algorithms & algorithm analysis, and Basic Knowledge in programming.

Rationale: ADHOC Network & its protocol's knowledge is necessary for communication Engineers.

Teaching and Examination Scheme:

Teaching Scheme (Hrs/Week)			Cr	Examination Scheme				Total
				External		Internal		
L	T	P		TH (E)	PRA(V)	Mid Exam (M)	P.A. (I)	
2	0	2	4	60	30	40	20	150

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Contents:

Sr. No.	Topic	Weightage	Teaching Hrs.
1.	**Introduction:** Fundamentals of Wireless Communication Technology, Radio Propagation Mechanisms, Characteristics of the Wireless Channel, IEEE 802.11a,b Standard, Origin Of Ad hoc: Packet Radio Networks, Architecture of PRNETs, Components of Packet Radios, Ad hoc Wireless Networks, What Is an Ad Hoc Network? Heterogeneity in Mobile Devices, Wireless Sensor Networks, Types of Ad hoc Mobile Communications, Types of Mobile Host Movement, Challenges Facing Ad Hoc Mobile Networks-Ad hoc wireless Internet.	20%	10
2.	**Ad Hoc Routing Protocols:** Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classifications of Routing Protocols, Destination Sequenced Distance Vector (DSDV), Wireless Routing Protocol (WRP), Cluster Switch Gateway Routing (CSGR), Ad Hoc On- Demand Distance Vector Routing (AODV), Dynamic Source Routing (DSR), Temporally Ordered Routing Algorithm (TORA), Signal Stability Routing (SSR), Location-Aided Routing (LAR), Power-Aware Routing (PAR), Zone Routing Protocol (ZRP).	25%	12
3.	**Multicast routing in Ad Hoc Networks:** Introduction, Issues in Designing a Multicast Routing Protocol, Operation of Multicast Routing Protocols, An Architecture Reference Model for Multicast Routing Protocols, Classifications of Multicast Routing Protocols, Tree-Based Multicast Routing Protocols, Mesh-Based Multicast Routing Protocols, Protocols - Energy-Efficient Multicasting, Multicasting with Quality of Service Guarantees, Application-Dependent Multicast Routing - Comparisons of Multicast Routing Protocols	25%	12
4.	**Transport Layer, Security Protocols:** Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocols for Ad Hoc Wireless Networks, Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad Hoc Wireless	20%	10

Sr. No.	Topic	Weightage	Teaching Hrs.
	Networks.		
5.	**QoS and Energy Management:** Introduction, Issues and Challenges in Providing QoS in Ad Hoc Wireless Networks, Classifications of QoS Solutions, MAC Layer Solutions, Network Layer Solutions, QoS Frameworks for Ad Hoc Wireless Networks Energy Management in Ad Hoc Wireless Networks, Need for Energy Management in Ad Hoc Wireless Networks, Classification of Energy Management Schemes, Battery Management Schemes, Transmission Power Management Schemes, System Power Management Schemes.	10%	04

Reference Books:

1. Ad Hoc Wireless Networks: Architectures and Protocols by Siva Ram Murthy C. and Manoj B.S., Tata Prentice Hall of India, 2004.
2. Ad Hoc Mobile Wireless Networks: Protocols and Systems by Toh C.K., Prentice Hall of India, 2001
3. Ad Hoc Networking by Charles E. Perkins, Addison Wesley, 2000.
4. Protocols & Architectures for Wireless Sensor Networks by Holger Karl& Andreas Willig, Wiley, 2005

Course Outcome:

After learning the course the students shall be:

1. Able to understand the principles of mobile ad hoc networks (MANETs) and distinguishes them from infrastructure-based networks.
2. Able to understand the principles and characteristics of wireless Ad hoc network.
3. Able to understand the different clustering algorithms and their usefulness for network management and routing.

List of Practical:

Based on Syllabus students shall perform following Practical.

1. Introduction to Network simulator 2.
2. To study and perform simple node connection using TCL.
3. To Perform Packet transfer using UDP protocol in NS2.
4. To Perform Two way flow of packets using UDP protocol in NS2.
5. To Perform Unequal packet drop using UDP protocol in NS2.
6. To Perform Equal drop of packets using TCP protocol in NS2.
7. Implementation and study of Destination Sequenced Distance Vector (DSDV) in NS2.
8. Implementation and study of Ad Hoc on- Demand Distance Vector Routing (AODV) in NS2.
9. Implementation and study of Ad Hoc on- Demand Multi path Distance Vector Routing (AOMDV) in NS2.
10. Implementation and study of Dynamic Source Routing (DSR) in NS2.
11. Implementation and study of Temporally Ordered Routing Algorithm (TORA) in NS2.

Major and Minor Equipments:

1. NS2 (open source network simulation software)
2. Visual Studio.NET Compact Framework for Pocket PC programming (optional).

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