PARUL UNIVERSITY - FACULTY OF ENGINEERING & TECHNOLOGY

Department of Electronics & Communication Engineering

SYLLABUS FOR 1st Sem MTech PROGRAMME

Wireless Communication (03204101)

Type of Course: MTech

Prerequisite: Higher Engineering Mathematics, Fundamental knowledge of Signals and Systems, Digital Communication theory, Probability and random processes, Programming skills in Simulation Exercises.

Rationale: The purpose of this course is to provide an understanding of modern Digital mobile and wireless communication systems. Also give knowledge of recent trends in the field of wireless communication.

Teaching and Examination Scheme:

Teaching Scheme (Hrs./Week)			Credit	Examination Scheme					Total
				External		Internal			
L	T	P		Theory	Practical	Theory	*C.E.	Practical	
2	0	2	3	60	30	20	20	20	150

L-Lectures; **T-**Tutorial; **P-**Practical; **C.E.-**Continuous Evaluation

Contents:

Sr.	Topic	Weightage	Teaching Hrs.
1	**Introduction to Wireless communication and Fadding**: Cellular structure, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies- Interference and system capacity-Co Channel Interference reduction and system capacity, Adjacent Channel interference, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring, Mobile Antennas, Large scale path loss:-Free Space Propagation loss equation, Path-loss of NLOS and LOS systems, Reflection, Ray ground reflection model, Diffraction, Scattering, Small scale multipath propagation.	20%	6
2	**Evolution of Mobile communication standards**: Second generation Cellular Networks, Networks, Third Generation (3G) Wireless Networks, Wireless Local Loop(WLL), Wireless Local Area network(WLAN), Bluetooth and Personal Area Networks, Overview of GSM, Introduction to CDMA, WCDMA, GPRS system architecture.	20%	6
3	**Statistical Multipath Channel Models and Capacity of Wireless Channels**: Time-Varying Channel Impulse Response, Narrowband fading models, Discrete-Time Model, Wideband Fading Models.	15%	3
4	**Diversity**: Diversity Techniques-Derivation of selection Diversity improvement, Derivation of Maximal Ratio Combining improvement, Practical Space Diversity Consideration- Selection Diversity, Feedback or Scanning Diversity, Maximal Ratio Combining, Equal Gain Combining, Polarization Diversity, Frequency Diversity, Time Diversity.	15%	3

5	**OFDM and MIMO**: Introduction to OFDM, Multicarrier Generation of sub-carriers using the IFFT OFDM signal processing and Trans-receiver blocks; Peak Power Problem: PAPR reduction schemes, SNR performance, Introduction to MIMO.	15%	6
6	**Advances in wireless**: Wi-Fi, Wi-MAX, Introduction to 4G-LTE & LTE Advanced and 5G standards, Cognitive radio.	15%	6

***Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

Reference Books:

1. Wireless Communications
   Theodore S. Rappaport; Prentice hall Publication; 2nd Edition
2. Wireless Communications
   Andrea Goldsmith; Cambridge University Press
3. Wireless Communications
   Andreas F. Molisch; WSE Publication; 2nd
4. Principles & Applications of GSM
   Vijay K. Garg; Morgan Kaufmann publication
5. MIMO Wireless Communications
   Ezio Biglieri; Cambridge University Press

Useful Links:

1. www.3gpp.org/technologies/keywords/acronymns/97-lteadvanced

2. https://gsmaintelligence.com/research-5G.pdf

3. www.dsplog.com

4. www.xgtechnology.com/cognitive-radio-networks

5. www.supelec.fr/d2ri/flexibleradio/course/ofdmtutorial

6. www.ll.mit.hupdu/publication/journals/pdf/volume15_no1

Course Outcome:

After Learning the course the students shall be able to:

1. Design a mobile cellular network.
2. Select the apt diversity scheme for a given wireless system to improve the performance.
3. Propose a suitable multiple access techniques such as CDMA, and OFDM for spectral allocation.
4. Gain knowledge of underlying mobile standards and the future mobile technologies such as W-CDMA, Wi-Max, and also the upcoming 4G and 5G mobile standards.

List of Practical:

1. To study and observe two Ray ground reflection model for 1800 MHz frequency.
2. Plot Path loss Curve with respect to distance for different values of path loss exponent between 2 to 6.
3. To study and observe the effect of AWGN, Rayleigh & Rician fading channel on transmitted signal.
4. To observe the effect three path Rayleigh channel and calculate the delay between transmitted and received signal.
5. Create a frequency-flat Rayleigh fading channel object.
6. Create a Rician fading channel object.
7. To Study and Building a DSSS Model With Simulink and also measure BER For Various SNR.

8. To study CDMA 2000 physical Layer.
9. To study W-CDMA 2000 physical Layer.
10. To simulate different diversity techniques over flat fading Rayleigh channels.
11. Compute BER for BPSK modulation in 3 tap ISI % channel with Zero Forcing equalization.
12. Estimate the BER performance for a space-time block coded system using two transmit and two receive antennas.
13. Simulation of OFDM system in Matlab – BER Vs Eb/N0 for OFDM in AWGN channel.

PARUL UNIVERSITY - FACULTY OF ENGINEERING & TECHNOLOGY

Department of Electronics & Communication Engineering

SYLLABUS FOR 1st Sem MTech PROGRAMME

Statistical Signal Analysis (03204102)

Type of Course: MTech

Prerequisite: Higher Engineering Mathematics, Knowledge of Electronics and Communication Systems and Technologies, Probability and Information Theory.

Rationale: To develop understanding of the concepts for classification of random variables , random sequences ,stochastic processes and statistical estimation and apply the same in the field of statistical signal processing.

Teaching and Examination Scheme:

Teaching Scheme (Hrs./Week)			Credit	Examination Scheme					Total
				External		Internal			
L	T	P		Theory	Practical	Theory	*C.E.	Practical	
3	1	0	4	60	30	20	20	20	150

L-Lectures; **T-**Tutorial; **P-**Practical; **C.E.-**Continuous Evaluation

Contents:

Sr.	Topic	Weightage	Teaching Hrs.
1	**The Concept of a Random Variable**: Introduction, Distribution and Density, Functions, Specific Random Variables, Conditional Distributions, Asymptotic Approximations for Binomial Random Variable, Functions of One Random Variable, The Random Variable g(x) , The Distribution of g(x), Mean and Variance Moments, Characteristic Functions.	25%	10
2	**Sequence of Random variables**: Two Random Variables, Bivariate Distributions, One Function of Two RandomVariables, Two Functions of Two Random Variables, Joint Moments, Joint Characteristic Functions, Conditional Distributions, ConditionalExpected Values, Sequences of Random Variables, General Concepts, Conditional Densities, Characteristic Functions and Normality, Mean Square Estimation, Stochastic Convergence and Limit Theorems, Random Numbers: Meaning and Generation.	25%	10
3	**Stochastic Processes**: General Concepts, Definitions, Systems with Stochastic Inputs, The Power Spectrum, Discrete-Time Processes, Random Walks and Other Applications Random Walks, Poisson Points and Shot Noise, Modulation, Cyclostationary Processes, Band limited Processes and Sampling Theory, Deterministic Signals in Noise, Bispectra and System, Mean Square Estimation of Random Process.	25%	10

4	**Spectral Representation**: Factorization and Innovations, Finite-Order Systemsand State Variables, Fourier Series and Karhunen–Lo`eveExpansions, Spectral Representation of Random Processes.	10%	4
5	**Markov Chainsand Markov Process**: Introduction, Higher Transition Probabilities and the Chapman–Kolmogorov Equation, Classification of States, Stationary Distributions and Limiting Probabilities, Transient States and Absorption Probabilities, Branching Processes, Markov Processes.	15%	6

***Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

Reference Books:

1. Probability , Random Variables and Stochastic Processes
   AthanasiosPopoulis; Tata McGraw-Hill Publications; 4th
2. Probability and Random Processes for Electrical Engineering
   Leon-Garcia; Pearson Education; 2
3. Probability and Random Processes with Applications to Signal Processing
   Henry Stark and John Wliiam Woods; Prentice Hall Publications; 2

Useful Links:

1. www.nptel.ac.in

Course Outcome:

After Learning the course the students shall be able to:

1. Perform classification the random variables.
2. Understand the concept of stochastic processes.
3. Evaluate the performance of the communication Systems using Concepts of random variables and stochastic processes.
4. Perform parameter estimation.
5. Estimate the value of stochastic process.
6. Apply the concepts in Statistical Signal Processing.

PARUL UNIVERSITY - FACULTY OF ENGINEERING & TECHNOLOGY

Department of Electronics & Communication Engineering

SYLLABUS FOR 1st Sem MTech PROGRAMME

Advanced Digital Signal Processing (03204103)

Type of Course: MTech

Prerequisite: Higher Engineering Mathematics, Discrete-Time Signals & Systems (Ref. book 1, Ch-2, mentioned below), z-Transform & its Application to Analysis of LTI Systems (Ref. book 1, Ch-3, mentioned below) , Frequency Analysis of Signals & Systems (Ref. book 1, Ch-4, mentioned below), C programming concepts of arrays, pointers, structures and unions.

Rationale: PG Students of EC Engineering need to possess good understanding of the fundamentals and applications of discrete-time signals and systems, including sampling, convolution, filtering, and discrete Fourier transforms etc. They are expected to be able to design digital filters, and perform spectral analysis on real signals using the discrete Fourier transform. They should be able to design applications on DSP kit TMS320C6713 using Code Composer Studio (CCS).

Teaching and Examination Scheme:

Teaching Scheme (Hrs./Week)			Credit	Examination Scheme					Total
				External		Internal			
L	T	P		Theory	Practical	Theory	*C.E.	Practical	
3	-	2	4	60	30	20	20	20	150

L-Lectures; **T-**Tutorial; **P-**Practical; **C.E.-**Continuous Evaluation

Contents:

Sr.	Topic	Weightage	Teaching Hrs.
1	**Discrete Fourier Transform and Fast Fourier Transform**: Frequency domain Sampling, Properties of DFT, Circular Convolution, Linear Filtering Methods Based on the DFT, The discrete Cosine Transform, frequency analysis of signals using the DFT,Efficient computation of DFT (FFT Algorithms-DIT and DIF), Application of FFT Algorithms, The Goertzel Algorithm, The Chirp-z Algorithm, Quantization Effects in the Computation of DFT	25%	10
2	**Developing Simple Programmes with DSK 6713 DSP Starter Kit**: Get familiar with DSP Development System, Input and Output with the DSK using AIC23 Codec, Architecture and Instruction set of C6x Processor	20%	8
3	**Digital filters**: Direct-form, lattice, and cascade structures for FIR filters, Direct-form, lattice, and parallel structures for IIR filters, Coefficient quantization and round-off effects, Design of FIR filters, Design of linear-phase filters using a window function , Frequency-sampling design, Optimum equiripple design (Chebyshev approximation),Design of IIR filters, Design by impulse invarianceBilinear transform ,Characteristics of commonly used analog filters	25%	10

4	**Multirate digital signal processing**: Basic multirate operation (up sampling, down sampling),Efficient structures for decimation and interpolation,Decimation and interpolation with polyphase filters, Noninteger sampling rate conversion, Efficient multirate filtering, Application: Oversampled A/D and D/A converter	20%	8
5	**Filter design using DSK 6713**: FIR filter design and implementation using DSK 6713, IIR filter design and implementation using DSK 6713	10%	4

***Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

Reference Books:

1. Digital Signal Processing: Principles Algorithms and Applications (TextBook)
   Proakis J. G.and Manolakis D.G.; Pearson Education; 4th
2. Digital Signal Processing
   Oppenheim A. V, Schafer R.W.; Pearson Education
3. Digital Signal Processing: A computer based approach
   Mitra S.K.; Tata McGraw Hill
4. Digital Signal Processing and Applications with the C6713 and C6416 DSK
   Chassaing Ralph; Wiley Interscience, a Johne Wiley & Sons, Inc; Publication

Course Outcome:

After Learning the course the students shall be able to:

After learning the course the students shall be able to:
1. Compute DFT/FFT and IDFT/IFFT as applicable to any digital signal processing task.
2. Develop DSP applications using DSK kit and CCS tool.
3. Design and test digital filters.
4. Understand and use multirate digital signal processing.

List of Practical:

1. Code Composer Studio and DSP Processor Kit TMS320C6713.
2. Creating a new project, building and debugging the project
3. Generating Sine wave and testing using C6713 simulator.
4. Generating Sine wave on DSK6713 kit.
5. Generate different basic signals like square, triangular, sawtooth etc. using DSK6713
6. Implement Amplitude Modulation on DSK-6713
7. implementation of FIR Low pass filter on DSK6713
8. implementation of IIR filter on DSK6713
9. Taking convolution of two sequences x (n) and h (n) on DSK6713
10. FFT of sequence using on DSK6713
11. MATLAB implementation of convolution of two sequences x (n) and h (n)
12. MATLAB Implementation of Butterworth low pass filter
13. MATLAB implementation of Elliptic IIR low pass filter
14. MATLAB implementation to convert filter from direct form to cascade form

Open Ended Problems:

1. Write “C” program and MATLAB code to generate various sequences.
2. To write a MATLAB program to plot magnitude response and phase response of digital Butter worth High pass filter, low pass filter, band pass and band stop filter.
3. To write a MATLAB program to plot magnitude response and phase response of digitalChebyshev type-1 Low pass filter, high pass filter, Band pass filter and Band stop filter.
4. To write a MATLAB program to plot magnitude response and phase response of digital FIR LP filter, high pass filter, band pass and band stop filter using Hanning window
5. To write a MATLAB program to plot magnitude response and phase response of digital FIR LP filter,high pass filter, band pass and band stop filter using Hamming window.

PARUL UNIVERSITY - FACULTY OF ENGINEERING & TECHNOLOGY

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SYLLABUS FOR 1st Sem MTech PROGRAMME

Optical Communication And Network (03204131)

Type of Course: MTech

Prerequisite: Basic Knowledge of Communication theory, Electromagnetic Theory, Data communication and Networking , Optics, Mode theory of wave-guide.

Rationale: The course provides knowledge in the field of Optical Communication and Optical Network which is essential for researcher.

Teaching and Examination Scheme:

Teaching Scheme (Hrs./Week)			Credit	Examination Scheme					Total
				External		Internal			
L	T	P		Theory	Practical	Theory	*C.E.	Practical	
2	0	2	3	60	30	20	20	20	150

L-Lectures; **T-**Tutorial; **P-**Practical; **C.E.-**Continuous Evaluation

Contents:

Sr.	Topic	Weightage	Teaching Hrs.
1	**Fiber Optic Components**: Couplers, Isolator and Circulator, Active optical components, Bragg Gratings, Multilayer Dielectric Thin-Film Filters, Mach-Zehnder Interferometers, Arrayed Waveguide Grating, Wavelength Converters, Four waves mixing, Solitons.	25%	7
2	**Optical Amplifiers**: Basic Concepts ,Semi-conductor Optical Amplifiers , Pulse Amplification, System Application, Raman amplifiers, Amplifier Performance, Erbium-Doped Fiber Amplifiers & Gain Spectrum,Amplifier Noise,Wideband Optical amplifiers	25%	8
3	**WDM Network Elements and network design**: WDM Light wave Systems, WDM Transmitters and Receivers, Optical Line Terminals, Optical Line Amplifiers, Cost Trade- Offs: A Detailed Ring Network Example, LTD and RWA Problems, Dimensioning, Wavelength routing Networks, Statistical Dimensioning Models, Maximum Load Dimensioning Models, Dense wavelength division multiplexing	20%	6
4	**Optical Networks**: Network Topologies – FDDI Networks: - Frame and Token formats – Network operation. SONET/SDH: - Optical specifications – SONET frame structure-SONET layers-SONET/SDH networks, Optical Network Survivability –Basic Concepts, Protection in SONET/SDH, Optical Add/Drop Multiplexers, OADM Architectures, Reconfigurable OADMs Optical Cross connects, All-Optical OXC Configurations.	25%	8

5	**Next generation Optical internet Networks**: Optical Circuit switching, Optical burst Switching, Optical packet switching, Optical Ethernet, Frame format, Optical Access Networks: Network architecture overview, Enhanced HFC, Optical MEMS	5%	3

***Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

Reference Books:

1. Optical fiber communications., . (TextBook)
   ,by Keiser G; McGraw-Hill
2. Optical fiber communications
   Senior J; Principles and Practice, PHI
3. Fiber Optic Communication systems
   Govind P. Agrawal; A John Wiley & Sons, Inc., Publication
4. Optical Networks: A Practical Perspective
   Rajiv Ramaswami and Kumar N. Sivarajan,; Elsevier Publication.
5. Lightwave Communication Systems
   R PapannareddyPenram; International Publishing.

Course Outcome:

After Learning the course the students shall be able to:

After learning the course the students shall be able to:
1. Understand the basic elements of optical fiber transmission link, fiber modes and structure configurations.
2. Visualize the significance of the different kind of losses and dispersion management techniques in optical system performance.
3. Analyze and integrate fiber optical network components in variety of networking schemes, FDDI, SONET/ SDH and operational principles WDM.
4. Analyze the system performance WDM and DWDM.

List of Practical:

1. To understand fundamentals of graded index fiber.
2. To Perform interactive gratings simulations.
3. Write a MATLAB code to determine V-number and modes supported by a step index and graded index fiber.
4. Write a MATLAB code to see the effect of relative refractive index on required diameter of single mode operation.
5. Introduction to Optiwave Optisystem.
6. To design optical fiber amplifiers and fiber lasers.
7. To evaluate Gaussian pulse in optical fiber.
8. To observe video signal propagating optical fiber.
9. To study characteristics of LASER diode.
10. To study characteristics of LED diode.

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SYLLABUS FOR 1st Sem MTech PROGRAMME

Digital Satellite Communication (03204132)

Type of Course: MTech

Prerequisite: This course assumes that students have had an introduction to circuits, devices and fields, signals and systems, communication systems engineering and the basics of satellite communication.

Rationale: The course provides introductory as well as in depth knowledge of the field of Communication Engineering to the students of various branches of engineering.

Teaching and Examination Scheme:

Teaching Scheme (Hrs./Week)			Credit	Examination Scheme					Total
				External		Internal			
L	T	P		Theory	Practical	Theory	*C.E.	Practical	
2	0	2	3	60	30	20	20	20	150

L-Lectures; **T-**Tutorial; **P-**Practical; **C.E.-**Continuous Evaluation

Contents:

Sr.	Topic	Weightage	Teaching Hrs.
1	**Elements of Satellite communication**: Satellite Frequency bands ,Satellite Systems ,Transmission and Multiplexing, Modulation, Multiple Access, Frequency reuse by orthogonal polarizations, Advent of digital satellite communication.	15%	5
2	**Communications satellite, orbit and Description**: Orbit Period & Velocity, Effects of Orbital Inclination, Azimuth & Elevation, Coverage Angle & Slant Range, Eclipse, Placement of a Satellite In a Geostationary Orbit, Satellite Description.	15%	5
3	**Earth Station**: Earth Station Antenna, High Power Amplifier, Low Noise Amplifier, Up converter, Down Converter, Monitoring & Control, Reliability.	15%	5
4	**Satellite Link**: Basic Link Analysis, Interference Analysis, Rain-Induced Attenuation, Rain-Induced Cross Polarization Interference, System Availability, Satellite Links Design.	15%	5
5	**Frequency Division Multiple Access**: FDM-FM-FDMA, Intermodulation Products, Resulting From Amplitude Nonlinearity And From Both Amplitude & Phase Nonlinearities, Optimized C/I Plus Noise Ratio.	15%	5

6	**Time Division Multiple Access**: TDMA Frame Structure, Frame Acquisition & Synchronization, Satellite Position Determination, Burst Time Plan, Control & Coordination By The Reference Station, TDMA Timing, TDMA Equipment, Advanced TDMA Satellite Systems.	15%	3
7	**Satellite Services**: GEO and Non GEO Mobile satellite systems, Direct broadcast satellite services, GPS, Satellite Phones.	10%	2

***Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

Reference Books:

1. Digital Satellite Communication (TextBook)
   Ha Tri T.; Tata Mc Graw-Hill; 2nd Edition
2. Satellite Communications (TextBook)
   Timothy Pratt and C.W Bostian,Jeremy E. Allnutt; John Wiley & Sons; 1St Edition
3. Satellite Communications (TextBook)
   Dennis Roddy; Tata McGraw-Hill; 4TH Edition

Useful Links:

1. http://spacejournal.ohio.edu/

Course Outcome:

After Learning the course the students shall be able to:

1. Solve Current problems and emerging solutions in the applications of digital satellite communications.
2. Select and apply appropriate computational and analytical techniques to solve a given problem.
3. Sourcing, reading and critiquing scientific articles and technical reports. Presenting a written argument based on reading from a variety of sources.
4. Analyze modulation and coding schemes in satellite communication systems using principles and techniques developed throughout the course.
5. Design satellite link and different access system towards a satellite.

List of Practical:

1. To study active/passive satellites, uplink/downlink & transponders.
2. To study base band analog signal.
3. To Study analog FM/FDM TV Satellite Link.
4. To study Carrier to Noise ratio.
5. To study Signal to Noise ratio.
6. To study digital baseband signals.
7. To study Tele-command & telemetry.
8. To study Polarization of Antennas.
9. To study Fading Effect.
10. To study Path Loss Effect.
11. To study propagation delay.
12. To study RS-232 satellite communication link.

PARUL UNIVERSITY - FACULTY OF ENGINEERING & TECHNOLOGY

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SYLLABUS FOR 1st Sem MTech PROGRAMME

Advance Digital Image processing (03204134)

Type of Course: MTech

Prerequisite: Knowledge of Digital Signal Processing and Engineering Mathematics.

Rationale: The course provides knowledge in the field of image processing which is essential for researcher.

Teaching and Examination Scheme:

Teaching Scheme (Hrs./Week)			Credit	Examination Scheme					Total
				External		Internal			
L	T	P		Theory	Practical	Theory	*C.E.	Practical	
2	0	2	3	60	30	20	20	20	150

L-Lectures; **T-**Tutorial; **P-**Practical; **C.E.-**Continuous Evaluation

Contents:

Sr.	Topic	Weightage	Teaching Hrs.
1	**Digital Image Fundamentals**: Components of Image Procesing System, Human visual system, Image as a 2D data, Image representation – Gray scale and Color images, image sampling and quantization, Basic Relationships betwen Pixels. Statistical parameters, Measures and their signifcance, Mean, standard deviation, variance, SNR, PSNR.	25%	8
2	**Image enhancement**: Basic gray level Transformations, Histogram Procesing, Spatial Filtering, Preliminary Concepts, Extension to functions of two variables, Image Smothing, Image Sharpening, Frequency domain filtering,Homomorphic filtering	30%	10
3	**Image Restoration and Reconstruction**: Noise Models, Noise Reduction, Inverse Filtering, MMSE (Wiener) Filtering.	20%	4
4	**Image Segmentation**: Edge based segmentation, Region based segmentation, Region split and merge techniques, Region growing by pixel agregation, optimal thresholding, Hough Transform, boundary detection.	25%	8

***Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

Reference Books:

1. Digital Image Processing (TextBook)
   Rafael C. Gonzalez and Richard E. Woods; Pearson Education; 3rd
2. Digital Image Processing Using MATLAB
   Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins; Tata McGraw Hill

3. Fundamentals of Digital Image Processing
A. K. Jain; Pearson Education
4. Digital Image Processing
Pratt William; John Wiley & Sons
5. Digital Image Processing
S Jayaraman, S Esakirajan and T Verakumar; McGraw Hill

Course Outcome:

After Learning the course the students shall be able to:

After learning the course the students shall be able to:
1. Understand the concept of Explain various types of images and analyze various techniques for intensity transformation and spatial filtering with applications.
2. Construct, Differentiate and analyze filtering in frequency domain and spatial domain.
3. Understand and able to Examine most frequently used compression techniques and exemplify different Morphological operations in bio-medical images with application.

List of Practical:

1. To study and implement basic commands of MATLAB required for digital image processing technique.
2. To perform arithmetic operations on grayscale image.
3. To study the effect of down sampling and quantization techniques on the grayscale image.
4. To enhance the visual quality of the image using point processing techniques namely a) Image negative, b) Logarithmic transformation, and c) Power law transformation.
5. To display the histogram of the image and enhance the visual quality of the image with the help of histogram equalization technique.
5. To display the histogram of the image and enhance the visual quality of the image with the help of histogram equalization technique.
6. To perform the bit plane slicing method on grayscale image.
7. To demonstrate that the convolution in spatial domain is equivalent to multiplication in the frequency domain.
8. To detect edges of the image using basic edge detection algorithms.
9. To demonstrate the effect of different noise models on grayscale image.
10. To restore grayscale image form noisy image with the help of image restoration techniques.
11. To perform grayscale image despeckling using Lee filter.
12. To perform morphological operations on binary and grayscale image.

PARUL UNIVERSITY - FACULTY OF ENGINEERING & TECHNOLOGY

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SYLLABUS FOR 1st Sem MTech PROGRAMME

Wireless Networks And Protocols (03204135)

Type of Course: MTech

Prerequisite: Knowledge of Wireless Communication and Networking TCP/IP Fundaments Required.

Rationale: The course provides Understanding of radio standards and communication protocols for wireless network.

Teaching and Examination Scheme:

Teaching Scheme (Hrs./Week)			Credit	Examination Scheme					Total
				External		Internal			
L	T	P		Theory	Practical	Theory	*C.E.	Practical	
2	0	2	3	60	30	20	20	20	150

L-Lectures; **T-**Tutorial; **P-**Practical; **C.E.-**Continuous Evaluation

Contents:

Sr.	Topic	Weightage	Teaching Hrs.
1	**Wireless Personal Area Networks**: Bluetooth-IEEE 802.15.1: Bluetooth Protocol Stack, Bluetooth Link Type, Bluetooth Security. Network Connection establishment in Bluetooth, ZigBee Technology.	20%	6
2	**Wireless Local Area Networks**: WLAN Technologies, Protocol architecture, Physical layer, Data link layer, Medium access control layer, Interference between Bluetooth and IEEE 802.11, Security of 802.11 systems.	20%	6
3	**Wireless Wide Area Networks**: GSM Evolution for data, 3G Wireless Systems, CDMA One Evolution, Evolution of cdmaOne to cdma2000 , Differences between cdma2000 & WCDMA.	20%	6
4	**TCP over wireless network**: Overview of traditional TCP, Impact on the performance of TCP over wireless environment, Link Layer Scheme (Snoop Protocol), The I-TCP protocol, The mobile TCP protocol.	15%	4
5	**Wireless Sensor Networks**: Introduction of Wireless Sensor Networks, Usage of Wireless Sensor Networks, Wireless Sensor Networks Model, Sensor network protocol stack.	10%	3
6	**Mobile IP**: New architecture entities, Operation of Mobile IP, Message Format, Agent Discovery, Agent advertisement, Registration, Authentication, Route optimization, Mobility support for IPV6.	15%	5

***Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

Reference Books:

1. Wireless Communication & Networking
   Vijay K. Garg; Elsevier
2. Mobile communication
   J.Schiller; Pearson Education
3. Wireless Communication
   T.S.Rappaport; Pearson Edu.
4. Wideband CDMA for Third Generation Mobile Communications
   T. Ojanpera& R. Prasad; Artech House
5. Data Communication and Networking
   Forouzan; McGraw-Hill; Fourth Edition

Useful Links:

1. www.dsplog.com
2. www.xgtechnology.com/cognitive-radio-networks
3. www.supelec.fr/d2ri/flexibleradio/course/ofdmtutorial
4. www.ll.mit.hupdu/publication/journals/pdf/volume15_no1

Course Outcome:

After Learning the course the students shall be able to:

1. Understand wireless communication standards, mobile/wireless TCP and wireless LAN, mobile ad-hoc networks.
2. Understand challenges in evolving wireless communications and various generations of wireless networks.
3. Apply appropriate cellular/wireless techniques and standards for wireless communication applications.
4. Analyze problems in providing mobile services.
5. Understand challenges in Wireless Sensor Networks.

List of Practical:

1. Simulation of Bluetooth Protocol.
2. Simulation of Wireless Local Area Networks.
3. Implementation of TCP over wireless network.
4. Implementation Wireless Sensor Networks Model.
5. Simulation of Sensor network protocol.
6. Simulation of Route optimization.
7. Implementation of WATM model.
8. Study of Bluetooth Security.
9. Simulation and Study of operation of Mobile IP.
10. Simulation of Access Point Control Protocol.

PARUL UNIVERSITY - FACULTY OF ENGINEERING & TECHNOLOGY

Department of Electronics & Communication Engineering

SYLLABUS FOR 1st Sem MTech PROGRAMME

Real Time Embedded System Design (03212101)

Type of Course: MTech

Prerequisite: Digital Electronics fundamentals, Microprocessors (8085 / 8086), Micro-controller (8051) and Basic knowledge of Computer.

Rationale: This Course provides the concept of Embedded System Design by understanding various Micro-controllers, programming skills and operating systems. This subject covers sufficient knowledge in all aspects to design own Small Scale Real Time Embedded Systems.

Teaching and Examination Scheme:

Teaching Scheme (Hrs./Week)			Credit	Examination Scheme					Total
				External		Internal			
L	T	P		Theory	Practical	Theory	*C.E.	Practical	
3	0	2	4	60	30	20	20	20	150

L-Lectures; **T-**Tutorial; **P-**Practical; **C.E.-**Continuous Evaluation

Contents:

Sr.	Topic	Weightage	Teaching Hrs.
1	**Introduction to Embedded Systems**: Embedded system overview, Design challenges,Embedded Systems V s General Computing Systems, Embedded Hardware units and Devices in System, Different Embedded Processors, Embedded Software in a System, Design Process in Embedded Systems, Classifications of Embedded Systems, Examples of Embedded Systems.	10%	5
2	**ARM7-LPC2148**: Architecture, System Peripherals, Bus Structure, Memory Map, Register Programming, Memory Accelerator Module, FLASH Memory Programming, External Bus Interface, Booting process, Phase Locked Loop, Power Control and LPC2000 Interrupt System.	20%	10
3	**Embedded Programming**: Introduction to Assembly and Embedded C Language, Introduction to KEIL IDE/WINARM, Basics of Embedded C --Data types, Looping, Functions, Array, String, Pointers, I/O Programming in C, Arithmetic & Logical Operations in C, Data Serialization in C, Data Conversion in C etc.	15%	6
4	**Embedded System Design – Case Study**: Interfacing LCD Display, Keypad Interfacing, ADC, DAC and Sensor Interfacing, DC Motor Control with PWM Generation, UART Interfacing, RTC interfacing, I2C Bus Interfacing, CAN Protocol.	25%	10

5	**RTOS**: Overview of OS Services and Goals, Various types of Real Time Operating Systems, Real Time Vs Conventional Operating Systems, Operating system service, Task, Semaphores, Data sharing and deadlocks, Inter process communication, Process management, Timer and Event function, Memory management, Device, File and I/O subsystem management, Interrupt routine in RTOS environment and handling of interrupt service calls, Basic design using RTOS (Micro C Os/ Free RTOS).	30%	12

***Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

Reference Books:

1. Embedded systems Architecture, Programming and Design
   Rajkamal; TMH; 2
2. Embedded System Design : A Unified Hardware Software introduction
   Frank Wahid, & Tony Givargis; John Wiley India
3. Introduction to Embedded Systems
   K. Shibu; TMH Edition
4. ARM System on Chip Architecture
   Steve Furber; Pearson Education; 2nd

Useful Links:

1. http://winarm.scienceprog.com/
2. http://www.nxp.com/products/microcontrollers/product_series/lpc2100_200_300_400/
3. http://www.freertos.org/

Course Outcome:

After Learning the course the students shall be able to:

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1. Understand the Software Architectures for Embedded Systems
2. Program Embedded Systems using programming languages
3. Define issues related to Programming, Run-time Environment
4. Analyze the embedded systems' specification and develop software programs
5. Evaluate the requirements of programming Embedded Systems, related software architectures and tool chain for Embedded Systems

List of Practical:

1. Exploring the GPIO port of ARM7 CPU target by blinking the LED connected tothe GPIO.
2. Write a program to generate 1KHz frequency using the Timer peripheral andcheck the result using the CRO or Logic Analyzer.
3. Write a program to demonstrate the external interrupt using a switch and LED.
4. Demonstrate the working of the PLL setting and show the result using the LED.
5. Write a program to demonstrate PWM with 50% duty cycle.
6. Write a program to generate square wave using the on-chip DAC of the ARM7 CPU.
7. Write a program to demonstrate the working of the Watchdog Timer.
8. Write a program to demonstrate the data transmission using UART.
9. Write a program to demonstrate the working of the CAN Protocol.
10. Write a driver routine for LCD and Matrix keyboard and demonstrate its working using the ARM7 target board.
11. Demonstrate the working of the on-chip RTC by writing a program to display thedifferent parameters on the LCD.
12. Write a program using U-COSII RTOS that create three tasks that blink the LEDat different rate.

13. Write a program using U-COSII RTOS that create two tasks, first task is LCD andsecond is Matrix Keyboard. The first task focuses on LCD and it continuously displays alphabets ‘A’ to ‘Z”. This task is configured for low priority. The Secondtask focuses on the Matrix Keyboard. It is configured for the higher priority and itdisplays the key code on the LCD. Use of Semaphore is recommended.
14. Create three tasks and start the multitasking. Task1: This task display character‘A’ to ’Z’. Task2: This task blinks the LED. Task3: This task Transmit the character on the serial Port.