



Society for Computer Technology and Research's
Pune Institute of Computer Technology
Department of Electronics & Telecommunication Engineering
COURSE OUTCOMES

Third Year (2019 Pattern) Semester I

304181: Digital Communication	
Students will be able to:	
304181.1	Apply the statistical theory to the communication signals and determine random signal parameter such as mean, autocorrelation and power spectral density (PSD). Classify and justify the given random processes as a Stationary, Wide sense stationary or Ergodic process by calculating mean, autocorrelation and power spectral density. Derive the output spectral density of the LTI system for given input PSD.
304181.2	Formulate and compute the SNR, Probability of error of Integrator-dump filter, Optimum filter and Matched filter and sketch the Impulse response of the matched filter. Draw the block diagram of the transmitter and receiver along with demonstration of Binary Amplitude Shift Keying (BASK), Binary Phase Shift Keying (BPSK), Binary Frequency Shift Keying (BFSK), Quadrature Phase Shift Keying (QPSK), M-ary Phase Shift Keying (MPSK) and explain the function of each block.
304181.3	Sketch the typical time-domain waveforms, signal space diagrams and spectrums of BPSK, BFSK, BASK and QASK (QAM). On the basis of bandwidth and BER, Analyze and compare the performance of BPSK, BFSK, BASK, under AWGN channel with reference to match filter and optimum filter receiver and calculate their probability of error.
304181.4	Design a PN sequence generator for given specifications, apply it to develop DSSS and FHSS techniques. Draw and explain the block diagram of the transmitter and receiver of DSSS and FHSS system, compare them by determining bandwidth, processing gain, jamming margin and probability of error. Demonstrate DSSS transmitter and receiver using suitable hardware setup.
304181.5	State Shannon's theorems on Information theory and apply them for the given DMS source to generate the Shannon Fano code, Huffman code, LZW code and Calculate Entropy, average code word length, efficiency, and redundancy. Derive and determine the Mutual information for the given discrete memoryless channel and classify the channel as BSC, BAC, Noiseless, Lossless and Useless channel.
304181.6	Formulate generator matrix for linear block code, generate all code words and compute the minimum hamming distance, Determine the error detection and correction capacity for linear block code. Determine the generator polynomials for (n, k) cyclic code, BCH Code and calculate systematic cyclic codes for given message word. Design and implement cyclic, convolutional encoder/decoder, specific generator polynomial.



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304182: Electromagnetic Field Theory	
Students will be able to:	
304182.1	State, apply electromagnetic laws (Coulomb's, Gauss's Law), formulate and determine the Electric fields (E, D), Electric Potential (V) due to the given uniform source such as point charge, infinite/finite line charge, and infinite surface charge.
304182.2	State, apply electromagnetic laws (Biot-Savart's, Ampere circuital's Law), formulate and determine the Magnetic fields (H, B) due to the given uniform source such as current carrying finite or infinite straight conductors, circular loop, and infinite sheet of current.
304182.3	Analyze the boundaries between various media (Conductor, Dielectric, Magnetic, capacitor), using appropriate Maxwell's Equation, derive, apply boundary conditions to compute the fields (E, D, H, B, P, M) on either side of the boundary. Determine Capacitance Inductance, Force, and Torque for a given specification.
304182.4	State, identify and apply Maxwell's equations (integral and differential forms) in both the forms (Static, time-varying or Time-harmonic field) for various media, determine unknown electric and magnetic fields, compute emf, time average power density using Poynting Theorem, Retarded magnetic vector potential for given specification.
304182.5	Analyze the scenario, and formulate simple uniform plane wave (Helmholtz Equations) and Transmission line equations for the same. Derive and compute wave parameters ($E_i, E_r, E_t, H_i, H_r, H_t, \eta, \epsilon, \mu, \sigma, \Gamma, \alpha, \beta, \gamma$, etc. for normal incidence) and transmission line parameters ($R, L, G, C, V, I, Z_0, Z_{in}, \alpha, \beta, \gamma, \Gamma, SWR$, with / or without Smith Chart) for the given specification.
304182.6	Identify, and investigate any application of Electromagnetics, prepare a report, and present (PPT) it as an individual, as a member or leader in a team.



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304183: Database Management	
Students will be able to:	
304183.1	Recall data handling and operations on data using various data structures and data types. Define database and file system to identify limitations and scope further. Describe various data models; discuss with examples an entity relational model with an appropriate relational algebra.
304183.2	Apply the concept of relational model to design a database for a given problem. Carry out normalization and decomposition techniques to improve data relations.
304183.3	Prepare relational databases using SQL DDL/DML commands to perform various operations to give solutions to the queries for developing databases. Construct advanced SQL queries on data and write functions, procedures, cursors and triggers through PL/SQL.
304183.4	Analyze transactions and concurrency control for a given database. Construct a model to manage the schedule for recovery.
304183.5	List types of parallel and distributed databases, define and discuss DBMS architectures for parallel, distributed and multi users, describe architecture, data storage and transactions.
304184: Microcontrollers	
Students will be able to:	
304184.1	Explain the fundamentals and internal architecture of 8051, modes of timer and serial communication of 8051. Discuss the interfacing of vital peripherals like seven segment display, ADC, DAC and stepper motor and various vital peripheral using Embedded C with 8051
304184.2	Identify various blocks and components of internal architecture of PIC 18FXX. Describe the pin diagram, interrupts, CCP modes, Timer Programming various serial communication protocols of PIC18FXX in detail. Discuss in detail interfacing of vital peripherals like LED, LCD and Keyboard, Motion Detectors, ADC, DAC, Stepper motor using Embedded C with PIC 18FXX.



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304185: Elective - I Computer Networks	
Students will be able to:	
304185.1	List and characterize various types of networks, topologies and types of addressing. Define and compare functionalities of layers in OSI model and TCP/IP protocol suite. Describe the significance of various networking devices used at different layers.
304185.2	State and explain functionalities of data link layer. Analyze data link layer protocols with reference to the functionalities. Describe and compare media access control techniques.
304185.3	Compare switching techniques. Explain technical details of IP addressing for classful and classless routing, IP and ICMP.
304185.4	Describe, compare and analyze various intra domain, inter domain, unicasting and multicasting routing protocols.
304185.5	Explain the functions of the transport layer and compare the performance of UDP, TCP and SCTP protocols with respect to QoS for different applications.
304185.6	Explain the working of various application layer protocols used for various networking tasks.
304185: Elective - I Fundamentals of JAVA Programming	
Students will be able to:	
304185.1	Explain various features of JAVA and JAVA programming structure. Elaborate fundamental concepts of JAVA including tokens, data types, variables and typecasting of variables, statements, and expressions.
304185.2	Define concepts of classes, objects, methods, constructors and implement method and constructor overloading.
304185.3	Illustrate special type of classes and multidimensional arrays. Discuss various types of inheritance and choose the appropriate method and inheritance to construct OOP features.
304185.4	Define the concept of interface and packages. Implement multiple inheritance using interface and code reusability using packages.
304185.5	Explain concepts of thread class for multithreading, catch statements for exception handling and life cycle of applet.
304185.6	Elaborate different stream classes for file handling to manage input and output.



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304186: Digital Communication Lab	
Students will be able to:	
304186.1	Simulate random process using MATLAB/OCTAVE. Determine various statistical parameters of the given random process and sketch autocorrelation function and power spectral density.
304186.2	Simulate various source coding techniques (Shanon-Fano, Huffman) and channel coding techniques (LBC) using MATLAB/Octave. Determine Efficiency and redundancy for the given Source Coding technique. Describe the designing of Error Control Coding circuit (cyclic) using flip-flops and ex-or gates.
304186.3	Write a program to simulate band pass modulation techniques (M-ary PSK, M-ary QAM) using MATLAB/Octave/LabVIEW. Plot constellation diagram, bit error rate Vs signal to noise ratio for given modulation scheme.
304186.4	Sketch the input bit sequence, carrier signal, ASK1, ASK2, BFSK waveforms, spectral diagrams and Calculate Bandwidth of FSK practically using suitable hardware setup/kit. Generate the input bit sequence, sketch the waveform and Verify the Baseband receiver performance in presence of Noise using suitable hardware setup/kit.
304186.5	Draw a block diagram of DSSS transmitter and receiver. Perform the experiment to Generate and Sketch the waveforms for PN CODE and DSSS using hardware setup/kit.

304187: Database Management Lab	
Students will be able to:	
304187.1	Understand the database management system software requirements and install MySQL software.
304187.2	Prepare and Design relational database using SQL DDL/DML commands to demonstrate various operations to give solutions to the queries for developing databases. Construct advanced SQL queries on data and write functions, procedures, cursors and triggers through PL/SQL.
304187.3	Implement a project using the concept of relational database model and database connectivity as an individual and/or in a team and write a report and draw conclusions at technical level.

304188: Microcontroller Lab	
Students will be able to:	
304188.1	Implement basic programming of 8051, Design and Implement interface of LED, DAC, stepper motors and various vital peripheral using Embedded C with 8051 μ C.
304188.2	Design and Implement interface of LED, buzzer, switch, LCD, ADC, communication protocols like USART, I2C and CCP Module to control the speed of DC motor, generate square wave using timer interrupt in Embedded C with PIC18F 4550 μ C.



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304189: Elective I Lab: Computer Networks Lab	
Students will be able to:	
304189.1	Implement LAN using appropriate topology and network components. Execute network commands related to LAN and WAN.
304189.2	Analyze the received traffic related to various protocols and utilities.
304189.3	Demonstrate installation and configuration of application servers.
304189.4	Configure a router using a network simulator.
304189: Elective I Lab: Fundamentals of JAVA Programming Lab	
Students will be able to:	
304189.1	Apply fundamental constructs of JAVA programming to perform the mathematical operations.
304189.2	Demonstrate method and constructor overloading and implement multi-dimensional array using JAVA programming.
304189.3	Employ the concept of inheritance and interface using JAVA programming.
304189.4	Demonstrate concept of exception handling, file handling operations and graphics class using JAVA programming.
304189.5	Design and develop an application using JAVA programming.
304190: Skill Development	
Students will be able to:	
304190.1	Design power supply and Conduct its troubleshooting.
304190.2	Design and implement the dc- dc converter and develop web page. Prepare manual/SOP (Standard Operating Procedure) for the same.
304190.3	Identify different types of batteries; summarize its usage with maintenance.
304190.4	Test Automotive Electronics (Sensors, Clusters, Controls, Semiconductor's devices etc.) and present case study of sensors used in EV.
304190.5	Prepare technical report on EV servicing, its calibration through industrial visit / expert talk.



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Third Year (2019 Pattern) Semester II

304192: Cellular Networks	
Students will be able to:	
304192.1	Describe wireless fading channel with its characteristics, analyze path loss/propagation models (free space, 2-ray, Hata), determine path loss, received power, channel estimation for a given scenario.
304192.2	Analyze & illustrate the fundamental concepts of OFDM & MIMO, draw and explain the block diagram of OFDM & MIMO.
304192.3	Investigate cell geometry of cellular mobile communication system, explain cell structure, cellular network, frequency reuse, handoffs techniques, cluster, cell splitting, cell sectoring. Plan and assign frequency channels for a given cellular configuration.
304192.4	Prepare a link budget for a given scenario of cellular network, apply tele-traffic theory to determine traffic, user capacity, channel allocation, blocking probability, etc. for a given specification.
304192.5	Sketch, enlist various components of 4G & 5G architectures, specify & Explain the performance parameters and protocols of 4G & 5G
304192.6	Describe the information theory relevance, the interference suppression, power control, MAC layer scheduling and connection admission with reference to cellular networks.

304193: Project Management	
Students will be able to:	
304193.1	Summarize the fundamentals of Project Management.
304193.2	Interpret and select the processes of Project Identification, Project Selection and project planning using the concepts of feasibility study, project Break-even point, project life cycle and work breakdown structure.
304193.3	Paraphrase project organizational structures and describe issues related to project management as well as various ways of conflict resolution.
304193.4	Use the project scheduling techniques to create a Project Schedule Plan and accordingly utilize the resources to meet the project deadline
304193.5	Specify, analyze, and reduce the project risk by various project management tools and manage the project finance by conducting feasibility studies and planning, arranging, and controlling the finance package.
304193.6	Determine product development stages, legal issues related to product development and entrepreneurship and factors impacting emergence of entrepreneurship.



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304194: Power Devices & Circuits	
Students will be able to:	
304194.1	Classify the power devices with respect to their construction, characteristics and applications. Determine pulse width duration (TON) required for successful firing of SCR from the given circuit conditions.
304194.2	Identify different power converters AC to DC, DC to AC, DC to DC, AC to AC converters, Sketch the input and output voltage & current waveform. Using area under the curve, Derive the expressions for Average DC load voltage (VLdc) & RMS load voltage (VLrms). Determine the conduction mode of 1 ϕ fully controlled bridge converter for firing angle of $\alpha=0^\circ$, $\alpha=90^\circ$, $\alpha=180^\circ$. For the converters, Calculate the performance parameters.
304194.3	Define the need of resonant converters, classify resonant converters with respect to their applications, Identify the protection circuits, summarize the various EMI& EMC standards
304194.4	Describe & Sketch the various Power Electronics Circuits with their applications. Compare online and offline UPS. State the specifications of batteries for EV & UPS

304195: Elective-II Digital Image Processing	
Students will be able to:	
304195.1	Apply the fundamentals of digital image processing to Implement various operations like point processing, image-enhancement in spatial domain on a given gray image. Perform Histogram equalization on an image and comment on the obtained results.
304195.2	Given a gray image, select an appropriate technique (similarity based or discontinuity based) to segment it. Derive the mask coefficients of First order Derivative (FoD) and Second order Derivatives (SoD) to detect an edge in an image. Considering an appropriate test case, analyze and compare the performance of FoD and SoD using parameters like response to constant intensity and to isolated intensities in an image. Discuss various Image compression techniques.
304195.3	Apply image-restoration to remove the noise from an image. Compare performance of spatial filtering, Weiner filtering and constrained least squares filtering. Discuss object recognition methods based on decision theoretic methods, structural methods and their applications.



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304195: Elective-II Advanced JAVA Programming	
Students will be able to:	
304195.1	Identify and compare the different API's for GUI creation, Explain various stages of Applets life cycle
304195.2	Differentiate various AWT/ swing components and apply event handling on relevant AWT/ swing components to handle the given event.
304195.3	Explain concepts of GUI applications using Abstract Windowing Toolkit (AWT), Swing and Event Handling.
304195.4	Elaborate Java Database Connectivity (JDBC) to develop an application to access database through Java programs.
304195.5	Describe the remote methods to invoke an application using Remote Method Invocation (RMI)
304195.6	Illustrate client /server communication application and servlets using Java Networking classes.

304195: Elective-II Network Security	
Students will be able to:	
304195.1	Classify attacks on computer systems and describe Cryptographic techniques
304195.2	List and Compare the Algorithms for Symmetric key, Asymmetric key & Hash functions. Describe various authentication techniques used for network security.
304195.3	List and demonstrate various aspects of E-mail security and web security.

304196: Cellular Networks Lab	
Students will be able to:	
304196.1	Analyze path loss/propagation models (free space, 2-ray, Hata), determine path loss, received power, channel estimation for a given scenario using OCTAVE /MATLAB/ VLab for different generations of Cellular Communication.
304196.2	Investigate Fading in wireless channel , fundamental concepts of OFDM & MIMO, and simulate the BER performance of various wireless systems under different SNR using OCTAVE /MATLAB/ VLab
304196.3	Interpret concepts of cell geometry (cell structure, frequency reuse, handoffs techniques, cluster, cell splitting, cell sectoring, frequency channels) of cellular network, and using OCTAVE /MATLAB/ VLab evaluate performance of the system.
304196.4	Apply tele-traffic theory to determine traffic, user capacity, channel allocation, blocking probability, etc. for a given specification. , Prepare a link budget for a given scenario of cellular network using OCTAVE /MATLAB/ VLab/MSExcel



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304197: Power Devices & Circuits Lab	
Students will be able to:	
304187.1	Illustrate and sketch and V-I characteristics of power devices.
304187.2	Construct and Test various power converters (AC-AC, AC-DC, DC-DC, DC-AC) and appraise the performance parameters.
304187.3	Implement and Examine regulation parameter and write a report and conclusion at technical level.

304198: Elective-II Digital Image Processing Lab	
Students will be able to:	
304198.1	Apply the fundamentals of digital image processing to perform various image-enhancement and Image segmentation operations on gray scale image.
304198.2	Perform the image compression techniques on image.

304198: Elective-II Advanced JAVA Programming Lab	
Students will be able to:	
304198.1	Illustrate client /server communication application and servlets using Java Networking classes.
304198.2	Create a database and perform some operation on database using JAVA programming and JDBC driver
304198.3	Develop the Remote Method Invocation application using JAVA programming
304198.4	Design servlet and develop the client/server communication using JAVA Networking classes.
304198.5	Design and develop an application using JAVA programming.

304198: Elective-II Network Security Lab	
Students will be able to:	
304198.1	Implement the knowledge of cryptography techniques for Network Security.
304198.2	Demonstrate installation and configuration of mobile Security App & Steganography technique in view of network security.
304198.3	Elaborate firewall, hash functions technique. Analyze browser configuration for Secured network.



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304199: Internship	
Students will be able to:	
304199.1	Apply theoretical knowledge to solve practical engineering problems.
304199.2	Analyze real world problems to find an engineering solution.
304199.3	Select a compatible modern engineering tool and use it effectively during the internship.
304199.4	Exhibit presentation and communication skills during formal interactions and seminars.

304200: Mini Project	
Students will be able to:	
304200.1	Formulate and present a project idea based on interest, literature survey, recent trends and real-life problems. Plan project work in team
304200.2	Implement electronic hardware by learning PCB artwork design, soldering techniques, testing, and troubleshooting etc. Identify appropriate solution and implement it using electronic hardware/software principles. Demonstrate the use of modern tools for simulation and implementation of the system.
304200.3	Prepare a technical report based on the mini project work. Comprehend and write a project report and draw conclusions at a technical level.
304200.4	Deliver technical seminar based on the mini project work carried out. Analyze and conform performance of system as per defined specifications. Demonstrate working of the implemented project through exhibition.