Hope Foundation's
International Institute of Information Technology
P-14, Rajiv Gandhi Info Tech Park, Phase – 1, Hinjawadi, Pune – 411 057

Department of Electronics and Telecommunication

Course Outcomes (COs)

SE (Electronics and Telecommunication) -2015 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)
204181	Signals and Systems	❑ Understand mathematical description and representation of continuous and discrete time signals and systems. ❑ Develop input output relationship for linear shift invariant system and understand the convolution operator for continuous and discrete time system ❑ Understand and resolve the signals in frequency domain using Fourier series and Fourier transforms ❑ Understand the limitations of Fourier transform and need for Laplace transform and develop the ability to analyze the system in s- domain. ❑ Understand the basic concept of probability, random variables & random signals and develop the ability to find correlation, CDF, PDF and probability of a given event.
204182	Electronic Devices and Circuits	❑ Comply and verify parameters after exciting devices by any stated method. ❑ Implement circuit and test the performance. ❑ Analyze small signal model of FET and MOSFET. ❑ Explain behavior of FET at low frequency. ❑ Design an adjustable voltage regulator circuits.
204183	Electrical Circuits and Machines	❑ Analyze basic AC & DC circuit for voltage, current and power by using KVL, KCL, andnetwork theorems. ❑ Explain the working principle of different electrical machines. ❑ Select proper electrical motor for given application. ❑ Design and analyze transformers.
204184	Data Structures and Algorithms	❑ Write and understand the programs that use arrays & pointers in C. ❑ Discuss the computational efficiency of the principal algorithms such as sorting & searching. ❑ Implement stacks & queues for various applications. ❑ Describe how arrays, records, linked structures are represented in memory and use them in algorithms. ❑ Understand various terminologies and traversals of trees and use them for various applications. ❑ Understand various terminologies and traversals of graphs and use them for various applications.
204185	Digital Electronics	❑ Use the basic logic gates and various reduction techniques of digital logic circuit in detail.

		❑ Design combinational and sequential circuits. ❑ Design and implement hardware circuit to test performance and application. ❑ Understand the architecture and use of microcontrollers for basic operations and Simulate using simulation software.
204186	Electronic Measuring Instruments and Tools	❑ Understand fundamental of various electrical measurements. ❑ Understand and describe specifications, features and capabilities of electronic instruments. ❑ Finalize the specifications of instrument and select an appropriate instrument for given measurement ❑ Carry out required measurement using various instruments under different setups. ❑ Able to compare measuring instruments for performance parameters. ❑ Select appropriate instrument for the measurement of electrical parameter professionally.
207005	Engineering Mathematics II	❑ Solve higher order linear differential equation using appropriate techniques for modeling and analyzing electrical circuits. ❑ Solve problems related to Fourier transform, Z-transform and applications to Communication systems and Signal processing. ❑ Obtain Interpolating polynomials, numerically differentiate and integrate functions, numerical solutions of differential equations using single step and multi-step iterative methods used in modern scientific computing. ❑ Perform vector differentiation and analyze the vector fields. ❑ Perform vector differentiation and integration, analyze the vector fields and apply to Electro-Magnetic fields. ❑ Analyze conformal mappings, transformations and perform contour integration of complex functions in the study of electrostatics and signal processing.
204187	Integrated Circuits	❑ To understand characteristics of IC and Op-Amp and identify the internal structure. ❑ To introduce various manufacturing techniques. ❑ To study various op-amp parameters and their significance for Op-Amp. ❑ To learn frequency response, transient response and frequency compensation techniques for Op-Amp. ❑ To analyze and identify linear and nonlinear applications of Op-Amp. ❑ To understand functionalities of PLL and its use in various applications in communication and control systems
204188	Control System	❑ Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems. ❑ Determine (Absolute) stability of a closed loop control system. ❑ Perform time domain and frequency domain analysis of control systems required for stability analysis. ❑ Perform time domain and frequency domain correlation analysis ❑ Apply root locus, frequency plot technique to analyze control

		system**.**
204189	Analog Communication	❑ Understand and identify the fundamental concepts and various components of analog communication systems. ❑ Understand, analyze and explain various analog modulation demodulation schemes. ❑ Understand the performance of analog communications systems under the presence of noise. ❑ Develop the ability to compare and contrast the strengths and weaknesses of various communication systems. ❑ Explain signal to noise ratio, noise figure and noise temperature for single and cascaded stages in a communication system. ❑ Describe analog pulse modulation techniques and digital modulation technique.
204190	Object Oriented Programming	❑ Describe the principles of object oriented programming. ❑ Apply the concepts of data encapsulation, inheritance in C++. ❑ Understand basic program constructs in Java ❑ Apply the concepts of classes, methods and inheritance to write programs Java ❑ Use arrays, vectors and strings concepts and interfaces to write programs in Java. ❑ Describe and use the concepts in Java to develop user friendly program.
204191	Employability Skill Development	❑ Have skills and preparedness for aptitude tests. ❑ Be equipped with essential communication skills (writing, verbal and non-verbal) ❑ Master the presentation skill and be ready for facing interviews. ❑ Build team and lead it for problem solving.

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Course Outcomes (COs)

TE (Electronics and Telecommunication) -2015 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)
304181	Digital Communication	❑ Understand working of waveform coding techniques and analyse their performance. ❑ Analyse the performance of a baseband and pass band digital communication system in terms of error rate and spectral efficiency. ❑ Understand the effect of random signal & noise on digital signals. ❑ Perform the time and frequency domain analysis of the signals in a digital communication system ❑ Design of digital communication system. ❑ Understand working of spread spectrum communication system and analyse its performance.
304182	Digital Signal Processing	❑ Analyze the discrete time signals and system using different transform domain techniques. ❑ Design and implement LTI filters for filtering different real world signals. ❑ Develop different signal processing applications using DSP processor. ❑ Capable of calibrating and resolving different frequencies existing in any signal.
304183	Electromagnetics	❑ To introduce the basic mathematical concepts related to electromagnetic vector fields. ❑ To impart knowledge on the concepts of electrostatics, electric potential, energy density and their applications. ❑ To impart knowledge on the concepts of magnetostatics, magnetic flux density, scalar and vector potential and its applications. ❑ To impart knowledge on the concepts of Faraday's law, induced emf and Maxwell's equations ❑ To impart knowledge on the concepts of Concepts of electromagnetic waves and Transmission lines
304184	Microcontrollers	❑ Learn importance of microcontroller in designing embedded application ❑ Learn use of hardware and software tools. ❑ Develop interfacing to real world devices. ❑ Learn programming language for real world devices

		❑ Interface different peripherals with 8051 & PIC microcontroller ❑ Implement embedded systems for communication of peripherals with microcontroller
304185	Mechatronics	❑ Identification of key elements of mechatronics system and its representation in terms of block diagram. ❑ Understanding basic principal of Sensors and Transducer. ❑ Understanding various Hydraulic Systems. ❑ Understanding various Pneumatic Systems. ❑ Understanding concept of actuator. ❑ Able to prepare case study of the system given.
304191	Signal Processing and Communications Lab	❑ Understand working of waveform coding techniques and analyse their performance. ❑ Understand time and frequency domain analysis of line codes. ❑ Acquired knowledge about different M-ary modulation techniques. ❑ Understand the effect of random signal & noise on digital signals. ❑ Understand working of spread spectrum communication system and analyse its performance. ❑ Analyze the discrete time signals and system using different transform domain techniques & their properties. . ❑ Design and implement LTI filters for filtering different real world signals. ❑ Develop different signal processing applications using DSP processor. ❑ Analyse effect of different windowing function on filter response. ❑ Analyze effect of different sampling frequencies.
304192	Microcontrollers and Mechatronics Lab	❑ Learn to program microcontroller using assembly language ❑ Learn to program microcontroller using embedded c language ❑ Learn to use different hardware and software tools to be used for different microcontroller ❑ Implement embedded systems for communication of peripherals with microcontroller ❑ Interface different peripherals with 8051 & PIC microcontroller ❑ Learn to implement real world embedded system application ❑ Learn to programme microcontroller using assembly language and embedded c language. ❑ Learn to use different hardware and software tools to be used for different microcontroller. ❑ Interface different peripherals with 8051 & PIC microcontroller. ❑ To develop a simulation model for simple physical systems and explain mechatronics design process. ❑ To design and implement data acquisition system. ❑ To design and implement various case studies of Mechatronics systems.
304193	Electronics System Design	❑ Design switch mode power supply by applying the fundamental concepts, working principles of electronics devices, selecting appropriate components and devices by interpreting datasheets and validate its performance by simulating the same using EDA tool.

		❑ Design prototype of Data Acquisition system. by applying the fundamental concepts, working principles of electronics devices, selection of appropriate components and devices, transducer and signal conditioning circuit by interpreting datasheets. ❑ Create, manage the database and query handling using suitable tools. ❑ Design prototype of communication block by applying the fundamental concepts, working principles of electronics devices, select appropriate components and devices by interpreting datasheets. ❑ Shall be able to use PCB Design tool for schemetic and layout design.
304186	Power Electronics	❑ Design & implement a triggering / gate drive circuit for a power device. ❑ Understand, perform & analyze different AC-DC power converters. ❑ Understand, perform & analyze different DC-AC converters. ❑ Understand, perform & analyze different DC-DC converters. ❑ Evaluate battery backup time & design a battery charger. ❑ Design & implement over voltage / over current protection circuit.
304187	Information Theory Coding and Communication Networks	❑ Perform information theoretic analysis of communication system. ❑ Design a data compression scheme using suitable source coding technique. ❑ Design a channel coding scheme for a communication system. ❑ Understand and apply fundamental principles of data communication and networking. ❑ Apply flow and error control techniques in communication networks. ❑ Select an appropriate error correcting codes for a particular application.
304188	Business Management	❑ Get overview of Management Science aspects useful in business. ❑ Overview of marketing & importance of social media in marketing ❑ Understand the crypto currency concept ❑ Get overview of Management Science aspects useful in business. ❑ Get motivation for Entrepreneurship ❑ Get Quality Aspects for Systematically Running
304189	Advanced Processors	❑ Describe the ARM microprocessor architectures and its feature ❑ Interface the advanced peripherals to ARM based microcontroller ❑ Design embedded system with available resources ❑ Use of DSP Processors and resources for signal processing applications

		❑ To program peripherals to arm microcontroller ❑ Learn advance tool to program ARM microcontroller
304190	System Programming and Operating Systems	❑ Demonstrate the knowledge of Systems Programming and Operating Systems. ❑ Formulate the Problem and develop the solution for same. ❑ Compare and analyze the different implementation approach of system programming operating system abstractions. ❑ Interpret various OS functions used in Linux / Ubuntu
304194	Power and ITCT Lab	❑ Design & implement a triggering / gate drive circuit for a power device. ❑ Understand, perform & analyze different power converters. ❑ Design & implement over voltage / over current protection circuit. ❑ Design a data compression scheme using suitable source coding technique. ❑ Design a channel coding scheme for a communication system. ❑ Understand and apply fundamental principles of data communication and networking. ❑ Implement information theoretic analysis using different information Measures. ❑ Implement different source coding techniques. ❑ Implement Encoding & decoding techniques for various codes. ❑ Understand how to transmit and receive text data with coding techniques. ❑ Understand and apply various Data compression techniques. ❑ Apply concepts to implement networking protocols.
304195	Advanced Processors and System Programming Lab	❑ Programming ARM7 based microcontroller ❑ Learn & understand UART communication ❑ Learn the concept of interrupt ❑ Learn communication protocol ❑ Programming DSP based microcontroller ❑ Understand the need of DSP processor ❑ To understand system software concepts, like the use and implementation of assembler, macros, linker, loader and compiler. ❑ To understand the concept of lexical analyzer and implement it. ❑ To explore memory allocation methods, input output devices and file system w.r.t various operating system. ❑ To understand the Deadlock, Deadlock avoidance, Deadlock Detection algorithms ❑ To study and Implement various processes, scheduling techniques schemes in operating system ❑ Interpret various OS functions used in Linux/Ubuntu and study its system calls.
304196	Employability Skills and Mini Project	❑ To understand the ―Product Development Process‟ including budgeting through Mini Project.

		❑ To plan for various activities of the project and distribute the work amongst team members. ❑ To inculcate electronic hardware implementation skills by - Learning PCB artwork design using an appropriate EDA tool. ❑ Imbibing good soldering and effective trouble-shooting practices. ❑ Following correct grounding and shielding practices. ❑ To develop student‘s abilities to transmit technical information clearly and test the same by delivery of Seminar based on the Mini Project. ❑ To understand the importance of document design by compiling Technical Report on the Mini Project work carried out.

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Department of Electronics and Telecommunication

Course Outcomes (COs)

BE (Electronics and Telecommunication) -2015 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)
404181	VLSI Design and Technology	❑ Write effective HDL coding for digital design. ❑ Apply knowledge of real time issues in digital design. ❑ Model digital circuit with HDL, simulate, synthesis and prototype in PLDs. ❑ Design CMOS circuits for specified applications. ❑ Analyze various issues and constraints in design of an ASIC ❑ Apply knowledge of testability in design and build self test circuit.
404182	Computer Networks and Security	❑ Understand fundamental underlying principles of computer networking ❑ Describe and analyze the hardware, software, components of a network and their interrelations. ❑ Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies ❑ Have a basic knowledge of installing and configuring networking applications. ❑ Specify and identify deficiencies in existing protocols, and then go onto select new and better protocols. ❑ Have a basic knowledge of the use of cryptography and network security.
404183	Radiation and Microwave Techniques	❑ Differentiate various performance parameters of radiating elements. ❑ Analyze various radiating elements and arrays ❑ Apply the knowledge of waveguide fundamentals in design of transmission lines. ❑ Design and set up a system consisting of various passive microwave components. ❑ Analyze tube based and solid state active devices along with their applications. ❑ Measure various performance parameters of microwave components
404184A	EL-I Digital Image and Video Processing	❑ Develop and implement basic mathematical operations on digital images. ❑ Analyse and solve image enhancement and image restoration problems.

		❑ Identify and design image processing techniques for object segmentation and recognition. ❑ Represent objects and region of the image with appropriate method. ❑ Apply 2-D data compression techniques for digital images. ❑ Explore video signal representation and different algorithm for video processing.
404184B	EL-I Industrial Drives and Controls	❑ Understand the basic principles of power electronics in drives and its control, types of drives and basic requirements placed by mechanical systems on electric drives for various applications ❑ Understand the operation of 1ϕ & 3ϕ converter drives for separately excited & series DC motors, dual converter drives, 2 quadrant and 4 quadrant DC chopper drives, Open-loop & closed-loop control of DC drives with transfer function, Dynamic and regenerative braking. Protection circuits for DC drives. ❑ Learn speed control of induction motor drives in an energy efficient manner using power electronics. To study and understand the operation of both classical and modern induction motor drives like FOC or Vector control. ❑ Learn and understand working of various types of synchronous motors and their drive systems ❑ Learn stepper motors & drives, BLDC and SRM motors and drives ❑ Understand modern control techniques of Fuzzy logic and ANN in motor drive application
404184C	EL-I Embedded System and RTOS	❑ Understand design of embedded system ❑ Use RTOS in embedded application ❑ Use modern architecture for embedded system ❑ Use Linux for embedded system development ❑ Use open platform for embedded system development
404184D	EL-I Internet of Things	❑ Understand the various concepts and terminologies and architecture of IoT systems. ❑ Use sensors and actuators for design of IoT. ❑ Understand wireless technologies for design of IoT systems. ❑ Understand and apply various protocols for design of IoT systems. ❑ Use various techniques of data storage and analytics in IoT. ❑ Understand various applications of IoT.
404185A	EL-II Wavelets	❑ On completion of the course, student will be able to ❑ Explore and learn the basics of linear algebra. ❑ Identify the need of Wavelet transform and its properties. ❑ Analyze the 1-D and 2-D signal using discrete wavelet transform. ❑ Analyze the signal using Multi resolution analysis ❑ Use wavelet transform in different applications like data compression, denoising, enhancement etc.
404185B	EL-II Electronics Product Design	❑ Understand various stages of hardware, software and PCBdesign.

		❑ Importance of product test &testspecifications. ❑ Special design considerations and importance ofdocumentation
404185C	EL-II Optimization Techniques	❑ Describe clearly a problem, identify its parts and analyze the individual functions. ❑ Perform mathematical translation of the verbal formulation of an optimizationproblem. ❑ Design algorithms, the repetitive use of which will lead reliably to finding an approximate solution ❑ Discover study and solve optimization problems. ❑ Investigate study, develop, organize and promote innovative solutions for various applications.
404185D	EL-II Artificial Intelligence	❑ Design and implement key components of intelligent agents and expert systems. ❑ To apply knowledge representation techniques and problem solving strategies to common AI applications. ❑ Apply and integrate various artificial intelligence techniques in intelligent system development as well as understand the importance of maintaining intelligent systems. ❑ Build rule-based and other knowledge-intensive problem solvers. ❑ To apply an understanding of pattern recognition in application & apply them ❑ To be able to analyze natural language
404185E	EL-II Electronics in Agriculture	❑ Understand Role of computers & virtual instrumentation. ❑ Provide communication solution for interpreting environmental parameters with Electronics systems. ❑ Describe Instrument technology used in agriculture. ❑ Apply knowledge of Electronics in Agriculture. ❑ Understand Greenhouse Technology & Role of Electronics Governance.
404186	Lab Practice I (CNS+RMT)	❑ Understand fundamental underlying principles of computer networking ❑ Describe and analyze the hardware, software, components of a network and their interrelations. ❑ Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies ❑ Have a basic knowledge of installing and configuring networking applications. ❑ To introduce fundamental theory of radiation and microwaves. ❑ To understand design principles of various radiating elements. ❑ To understand theory of passive and active components of microwave systems ❑ To learn microwave measurement techniques
404187	Lab Practice II (VLSI D&T + Elective I)	❑ Write effective HDL coding for digital design. ❑ Model digital circuit with HDL, simulate, synthesis and prototype in PLDs. ❑ Design CMOS circuits for specified applications.

		❑ Apply knowledge of testability in design and build self test circuit. ❑ Develop and implement basic mathematical operations on digital images. ❑ Analyze and solve image enhancement and image restoration problems. ❑ Identify and design image processing techniques for object segmentation and recognition. ❑ Represent objects and region of the image with appropriate method. ❑ Explore video signal representation and different algorithm for video processing ❑ Use sensors, actuators and wireless technologies for design of IoT. ❑ Understand and apply various protocols for design of IoT systems. ❑ Use various techniques of data storage and analytics in IoT.
404189	Mobile Communication	❑ Apply the concepts of switching technique and traffic engineering to design multistage networks. ❑ Explore the architecture of GSM. ❑ Differentiate thoroughly the generations of mobile technologies
404190	Broadband Communication Systems	❑ Perform Link power budget and Rise Time Budget by proper selection of components and check its viability. ❑ Perform Satellite Link design for Up Link and Down Link
404191A	Machine Learning	❑ To compare and contrast pros and cons of various machine learning techniques and to get an in sight of when to apply a particular machine learning approach. ❑ To mathematically analyze various machine learning approaches and paradigms. ❑ To implement convolution neural networks in recognition applications
404191B	PLCs and Automation	❑ Understand PLC architecture ❑ Develop PLC ladder programs for simple industrial applications ❑ Design Automation systems for industrial applications ❑ Implement the Engineering Automation using PLC approach
404191C	Audio and Speech Processing	❑ Design and implement algorithms for processing speech and audio signals considering the properties of acoustic signals and human hearing. ❑ Analyze speech signal to extract the characteristic of vocal tract (formants) and vocal cords (pitch). ❑ Analyze speech signal for extracting LPC and MFCC Parameters of speech signal. ❑ Apply the knowledge of speech and audio signal analysis to build speech processing applications like speech coding, speech recognition, speech enhancement and speaker recognition /verification.
404191D	Software Defined Radio	❑ Compare SDR with traditional Hardware Radio HDR. ❑ Implement modern wireless system based on OFDM,

		MIMO & Smart Antenna. ❑ Build experiment with real wireless waveform and applications, accessing both PHY and MAC, Compare SDR versus MATLAB and Hardware Radio ❑ Work on open projects and explore their capability to build their own communication System.
404191E	Audio Video Engineering	❑ Apply the fundamentals of Analog Television and Colour Television standards ❑ Explain the fundamentals of Digital Television, DTV standards and parameters. ❑ Study and understand various HDTV standards and Digital TV broadcasting systems and acquainted with different types of analog, digital TV and HDTV systems. ❑ Understand acoustic fundamentals and various acoustic systems.
404192A	Robotics	❑ Familiar with the history, concept development and key components of robotics technologies. ❑ Implement basic mathematics manipulations of spatial coordinate representation and transformation. ❑ Solve basic robot forward and inverse kinematic problems ❑ Understand and able to solve basic robotic dynamics, path planning and control problems
404192B	Biomedical Electronics	❑ Model a biomedical system. ❑ Understand various methods of acquiring bio signals. Understand various sources of bio ❑ signal distortions and its remedial techniques. ❑ Get an Overview of major Devices currently used in Medical field ❑ The students will have an understanding of analyzing bio-signal and classifying them
404192C	Wireless Sensor Networks	❑ Explain various concepts and terminologies used in WSN ❑ Describe importance and use of radio communication and link management in WSN ❑ Explain various wireless standards and protocols associated with WSN ❑ Recognize importance of localization and routing techniques used in WSN ❑ Understand techniques of data aggregation and importance of security in WSN ❑ Examine the issues involved in design and deployment of WSN
404192D	Renewable Energy Systems	❑ Interpret energy reserves of India and potential of different energy sources. ❑ Measure the solar radiation parameters and performance of different solar collectors. ❑ Calculate different parameters of wind turbine rotor. ❑ Implicit the importance and applications of geothermal and ocean energy. ❑ Demonstrate knowledge in field of fuel cell and potential for power generation