Modern Education Society's College of Engineering, Pune
Department of E&TC
COURSE OUTCOMES

2019 Course

SE Sem I

207005: Engineering Mathematics – III

CO1: Solve higher order linear differential equation using appropriate techniques for modelling, analyzing of electrical circuits and control systems.
CO2: Apply concept of Fourier transform & Z-transform and its applications to continuous & discrete systems, signal & image processing and communication systems.
CO3: 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.
CO4: Perform vector differentiation & integration, analyze the vector fields and apply to electro-magnetic fields & wave theory.
CO5: Analyze Complex functions, Conformal mappings, Contour integration applicable to electrostatics, digital filters, signal and image processing.

204181: Electronic Circuits

CO1: Assimilate the physics, characteristics and parameters of MOSFET towards its application as amplifier.
CO2: Design MOSFET amplifiers, with and without feedback, & MOSFET oscillators, for given specifications.
CO3: Analyze and assess the performance of linear and switching regulators, with their variants, towards applications in regulated power supplies.
CO4: Explain internal schematic of Op-Amp and define its performance parameters.
CO5: Design, Build and test Op-amp based analog signal processing and conditioning circuits towards various real time applications.
CO6: Understand and compare the principles of various data conversion techniques and PLL with their applications.

204182: Digital Circuits

CO1: Identify and prevent various hazards and timing problems in a digital design.
CO2: Use the basic logic gates and various reduction techniques of digital logic circuit.
CO3: Analyze, design and implement combinational logic circuits.
CO4: Analyze, design and implement sequential circuits.
CO5: Differentiate between Mealy and Moore machines.
CO6: Analyze digital system design using PLD.

204183: Electrical Circuits

CO1: Analyze the simple DC and AC circuit with circuit simplification techniques.
CO2: Formulate and analyze driven and source free RL and RC circuits.
CO3: Formulate & determine network parameters for given network and analyze the given network using Laplace Transform to find the network transfer function.
CO4: Explain construction, working and applications of DC Machines / Single Phase & Three Phase AC Motors.

CO5: Explain construction, working and applications of special purpose motors & understand motors used in electrical vehicles.
CO6: Analyze and select a suitable motor for different applications.

204184: Data Structures
CO1: Solve mathematical problems using C programming language.
CO2: Implement sorting and searching algorithms and calculate their complexity.
CO3: Develop applications of stack and queue using array.
CO4: Demonstrate applicability of Linked List.
CO5: Demonstrate applicability of nonlinear data structures - Binary Tree with respect to its time complexity.
CO6: Apply the knowledge of graph for solving the problems of spanning tree and shortest path algorithm

SE Sem II
204191: Signals & Systems
CO1: Identify, classify basic signals and perform operations on signals.
CO2: Identify, Classify the systems based on their properties in terms of input output relation and in terms of impulse response and will be able to determine the convolution between to signals.
CO3: Analyze and resolve the signals in frequency domain using Fourier series and Fourier Transform.
CO4: Resolve the signals in complex frequency domain using Laplace Transform, and will be able to apply and analyze the LTI systems using Laplace Transforms.
CO5: Define and Describe the probability, random variables and random signals. Compute the probability of a given event, model, compute the CDF and PDF.
CO6: Compute the mean, mean square, variance and standard deviation for given random variables using PDF.

204192: Control Systems
CO1: Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.
CO2: Determine the (absolute) stability of a closed-loop control system.
CO3: Perform time domain analysis of control systems required for stability analysis.
CO4: Perform frequency domain analysis of control systems required for stability analysis.
CO5: Apply root-locus, Frequency Plots technique to analyze control systems.
CO6: Express and solve system equations in state variable form.
CO7: Differentiate between various digital controllers and understand the role of the controllers in Industrial automation.

204193: Principles of Communication Systems
CO1: To compute & compare the bandwidth and transmission power requirements by analyzing time and frequency domain spectra of signal required for modulation schemes under study.
CO2: Describe and analyze the techniques of generation, transmission and reception of Amplitude Modulation Systems.
CO3: Explain generation and detection of FM systems and compare with AM systems.
CO4: Exhibit the importance of Sampling Theorem and correlate with Pulse Modulation technique (PAM, PWM, and PPM).

CO5: Characterize the quantization process and elaborate digital representation techniques (PCM, DPCM, DM and ADM).
CO6: Illustrate waveform coding, multiplexing and synchronization techniques and articulate their importance in baseband digital transmission.

204194: Object Oriented Programming
CO1: Describe the principles of object oriented programming.
CO2: Apply the concepts of data encapsulation, inheritance in C++.
CO3: Understand Operator overloading and friend functions in C++.
CO4: Apply the concepts of classes, methods inheritance and polymorphism to write programs C++. CO5: Apply Templates, Namespaces and Exception Handling concepts to write programs in C++. CO6: Describe and use of File handling in C++.

204199: Employbility Skills Development
CO1: Define personal and career goals using introspective skills and SWOC assessment. Outline and evaluate short-term and long-term goals.
CO2: Develop effective communication skills (listening, reading, writing, and speaking), self- management attributes, problem solving abilities and team working & building capabilities in order to fetch employment opportunities and further succeed in the workplace.
CO3: Be a part of a multi-cultural professional environment and work effectively by enhancing inter-personal relationships, conflict management and leadership skills.
CO4: Comprehend the importance of professional ethics, etiquettes & morals and demonstrate sensitivity towards it throughout certified career.
CO5: Develop practically deployable skill set involving critical thinking, effective presentations and leadership qualities to hone the opportunities of employability and excel in the professional environment.

204200: Project Based Learning
CO1: Identify the real-world problem (possibly of interdisciplinary nature) through a rigorous literature survey and formulate / set relevant aim and objectives.
CO2: Contribute to society through proposed solution by strictly following professional ethics and safety measures.
CO3: Propose a suitable solution based on the fundamentals of electronics and communication engineering by possibly the integration of previously acquired knowledge.
CO4: Analyze the results and arrive at valid conclusion.
CO5: Use of technology in proposed work and demonstrate learning in oral and written form.
CO6: Develop ability to work as an individual and as a team member.

204198: Data Analytics Lab
CO1: Install Python Jupyter and write programs using NumPy, Pandas, Matplotlib and Scikit-learn.
CO2. Write programs related to 1D and 2D arrays
CO3. Write programs using data seriesproject related to data analytics
CO4. Write programs using data frames
CO5. Write programs to visualize output using various graphs and plots
CO6. Complete an end to end project related to data analytics

TE Sem I
304181: Digital Communication
CO1: Apply the statistical theory for describing various signals in a communication system.

CO2: Understand and explain various digital modulation techniques used in digital communication systems and analyze their performance in presence of AWGN noise.
CO3: Describe and analyze the digital communication system with spread spectrum modulation.
CO4: Analyze a communication system using information theoretic approach.
CO5: Use error control coding techniques to improve performance of a digital communication system.

304182: Electromagnetic Field Theory
CO1: Apply the basic electromagnetic principles and determine the fields (E & H) due to the given source.
CO2: Apply boundary conditions to the boundaries between various media to interpret behavior of the fields on either sides.
CO3: State, Identify and Apply Maxwell's equations (integral and differential forms) in both the forms (Static, time-varying or Time-harmonic field) for various sources, Calculate the time average power density using Poynting Theorem, Retarded magnetic vector potential.
CO4: Formulate, Interpret and solve simple uniform plane wave (Helmholtz Equations) equations, and analyze the incident/reflected/transmitted waves at normal incidence.
CO5: Interpret and Apply the transmission line equation to transmission line problems with load impedance to determine input and output voltage/current at any point on the Transmission line, Find input/load impedance, input/load admittance, reflection coefficient, SWR, Vmax/Vmin, length of transmission line using Smith Chart.
CO6: Carry out a detailed study, interpret the relevance and applications of Electromagnetics

304183: Database Management
CO1: Ability to implement the underlying concepts of a database system.
CO2: Design and implement a database schema for a given problem-domain using data model.
CO3: Formulate, using SQL/DML/DDL commands, solutions to a wide range of query and update problems.
CO4: Implement transactions, concurrency control, and be able to do Database recovery.
CO5: Able to understand various Parallel Database Architectures and its applications.
CO6: Able to understand various Distributed Databases and its applications.

304184: Microcontroller
CO1: Understand the fundamentals of microcontroller and programming.
CO2: Interface various electronic components with microcontrollers.
CO3: Analyze the features of PIC 18F XXXX.
CO4: Describe the programming details in peripheral support.
CO5: Develop interfacing models according to applications.
CO6: Evaluate the serial communication details and interfaces.

304185 (A): Digital Signal Processing (Elective -I)
CO1: Interpret and process discrete/ digital signals and represent DSP system.
CO2: Analyze the digital systems using the Z-transform techniques.
CO3: Implement efficient transform and its application to analyze DT signals.
CO4: Design and implement IIR filters.
CO5: Design and implement FIR filters.
CO6: Apply DSP techniques for speech/ biomedical/ image signal processing.

304185 (C): Fundamentals of JAVA Programming (Elective -I)
CO1: Understand the basic principles of Java programming language
CO2: Apply the concepts of classes and objects to write programsin Java
CO3: Demonstrate the concepts of methods & Inheritance
CO4: Use the concepts of interfaces & packages for program implementation
CO5: Understand multithreading and Exception handling in Java to develop robust programs
CO6: Use Graphics class, AWT packages and manage input and output files in Java

304185 (D): Computer Networks(Elective -I)
CO1: Design LAN using appropriate networking architecture, topologies, transmission media, and networking devices.
CO2: Understand the working of controlling techniques for flawless data communication using data link layer protocols.
CO3: Learn the functions of network layer, various switching techniques and internet protocol addressing.
CO4: Explore various interior and exterior, unicasting and multicasting protocols.
CO5: Analyze data flow using TCP/UDP Protocols, congestion control techniques for QoS.
CO6: Illustrate the use of protocols at application layer.

304190: Skill Development
CO1: Student should recognize the need to engage in independent and life-long learning in required skill sets
CO2: Student needs to experience the impact of industries on society by visiting different industries and understand the importance of industrial products for analog and digital circuits and systems.
CO3: Student has to make use of the modern electronic and IT Engineering Tools and Technologies for solving electronic engineering problems.
CO4: Student would be able to communicate effectively at different technical and administrative levels.
CO5: Student will exhibit leadership skills both as an individual and as a member in a team in multidisciplinary environment.

304191A: Mandatory Audit Course 5
CO1:To know about various aspects of soft skills and learn ways to develop personality Leadership, team building,decision making and stress management
CO2:Find out engineering solutions to meet the environmental standards set by legislation.
CO3:Understand how the urbanization proceeds in the right path causing minimum impact on environment.
CO4:how to manage water resources, design conservation strategies, and develop energy and transportation policies that improve society and the environment.

TE Sem II
304192: Cellular Networks
CO1: Understand fundamentals of wireless communications.
CO2: Discuss and study OFDM and MIMO concepts.
CO3: Elaborate fundamentals mobile communication.
CO4: Describes aspects of wireless system planning.
CO5: Understand of modern and futuristic wireless networks architecture.
CO6: Summarize different issues in performance analysis.

304193: Project Management

CO1: Apply the fundamental knowledge of project management for effectively handling the projects. CO2: Identify and select the appropriate project based on feasibility study and undertake its effective planning.

CO3: Assimilate effectively within the organizational structure of project and handle project management related issues in an efficient manner.

CO4: Apply the project scheduling techniques to create a Project Schedule Plan and accordingly utilize the resources to meet the project deadline.

CO5: Identify and assess the project risks and manage finances in line with Project Financial Management Process.

CO6: Develop new products assessing their commercial viability and develop skillsets for becoming successful entrepreneurs while being fully aware of the legal issues related to Product development and Entrepreneurship.

304194: Power Devices & Circuits

CO1: To differentiate based on the characteristic parameters among SCR, GTO, MOSFET & IGBT and identify suitability of the power device for certain applications and understand the significance of device ratings.

CO2: To design triggering / driver circuits for various power devices.

CO3: To evaluate and analyze various performance parameters of the different converters and its topologies.

CO4: To understand significance and design of various protections circuits for power devices.

CO5: To evaluate the performance of uninterruptible power supplies, switch mode power supplies and battery.

CO6: To understand case studies of power electronics in applications like electric vehicles, solar systems etc.

304195 (A): Digital Image Processing (Elective -II)

CO1: Apply knowledge of mathematics for image understanding and analysis.

CO2: Implement spatial domain image operations.

CO3: Design and realize various algorithms for image segmentation.

CO4: Design and realize various algorithms for image Compression.

CO5: Apply restoration to remove noise in the image.

CO6: Describe the object recognition system.

304195 (C): Advanced JAVA Programming (Elective -II)

CO1: Design and develop GUI applications using Applets.

CO2: Apply relevant AWT/ swing components to handle the given event.

CO3: Design and develop GUI applications using Abstract Windowing Toolkit (AWT), Swing and Event Handling.

CO4: Learn to access database through Java programs, using Java Database Connectivity (JDBC)

CO5: Invoke the remote methodsin an application using Remote Method Invocation (RMI)

CO6: Develop program for client /server communication using Java Networking classes.

304199: Internship

CO1: To develop professional competence through internship.

CO2: To apply academic knowledge in a personal and professional environment.

CO3: To build the professional network and expose students to future employees.
CO4: Apply professional and societal ethics in their day to day life.
CO5: To become a responsible professional having social, economic and administrative considerations.
CO6: To make own career goals and personal aspirations

304200: Mini Project
CO1: Understand, plan and execute a Mini Project with team.
CO2: Implement electronic hardware by learning PCB artwork design, soldering techniques, testing and troubleshooting etc.
CO3: Prepare a technical report based on the Mini project.
CO 4: Deliver technical seminar based on the Mini Project work carried out.

BE Sem I
404181:Radiation & Microwave Theory
CO1: Apply the fundamentals of electromagnetic to derive free space propagation equation and distinguish various performance parameters of antenna.
CO2: Identify various modes in the waveguide. Compare: coaxial line, rectangular waveguides & striplines and identify applications of the same.
CO3: Explore construction and working of principles passive microwave devices/components.
CO4: Explore construction and working of principles active microwave devices/components.
CO5: Analyze the structure, characteristics, operation, equivalent circuits and applications of various microwave solid state active devices.
CO6: Know the various microwave systems, device set ups of microwave measurement devices and Identify the effect of radiations on environmental sustainability.

404182: VLSI Design and Technology
CO1: Develop effective HDL codes for digital design.
CO2: Apply knowledge of real time issues in digital design.
CO3: Model digital circuit with HDL, simulate, synthesis and prototype in PLDs.
CO4: Design CMOS circuits for specified applications.
CO5: Analyze various issues and constraints in design of an ASIC.
CO6: Apply knowledge of testability in design and Build In Self Test (BIST) circuit.

404183: Cloud Computing
CO1: Understand the basic concepts of Cloud Computing.
CO2: Describe the underlying principles of different Cloud Service Models.
CO3: Classify the types of Virtualization.
CO4: Examine the Cloud Architecture and understand the importance of Cloud Security.
CO5: Develop applications on Cloud Platforms.
CO6: Evaluate distributed computing and the Internet of Things.

404184: Elective-3
JAVA Script
CO1: Use basic features of java script.
CO2: Use relevant data types for developing application in java script.
CO3: Use the function and objects as self-contained, with data passing in and out through well-defined interfaces in development of small systems.
CO4: Apply the regular expression for Text matching and manipulation.

CO5: Explore use of the various aspects of JavaScript object models that are fundamental to the proper use of the language.
CO6: Develop the application using windows controlling and form handling.

Embedded & RTOS
CO1: Apply design metrics of Embedded systems to design real time applications to match recent trends in technology.
CO2: Apply Real time systems concepts.
CO3: Evaluate μCOS operating system and its services.
CO4: Apply Embedded Linux Development Environment and testing tools.
CO5: Analyze Linux operating system and device drivers.
CO6: Analyze the hardware – software co design issues for testing of real time Embedded system.

404185: Elective - 4
Deep Learning
CO1: Classify machine learning algorithms and its types
CO2: Discuss the concepts of deep learning and its Frameworks.
CO3: Identify the deep learning architecture with respect to the applications.
CO4: Demonstrate different architectures of Convolutional neural networks.
CO5: Discuss natural language processing architecture.
CO6: Make use of various case studies and Deep learning applications.
Data Mining
CO1: Understand the process of data mining and performance issues in data mining.
CO2: Apply data preprocessing techniques to the historical data collected in data warehouse
CO3: Analyze various types of Frequent pattern analysis methods and advanced Pattern mining techniques
CO4: Evaluate various data mining algorithms for developing effective data mining models
CO5: Analyze different clustering and outlier detection methods
CO6: Design data mining models in different mining application areas

2015 course

SE Sem I

204181: Signals and Systems
CO1: Understand mathematical description and representation of continuous and discrete time signals and systems.
CO2: Develop input output relationship for linear shift invariant system and understand the convolution operator for continuous and discrete time system.
CO3: Understand and resolve the signals in frequency domain using Fourier series and Fourier transforms.
CO4: Understand the limitations of Fourier transform and need for Laplace transform and develop the ability to analyze the system in s- domain.
CO5: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
CO1: Comply and verify parameters after exciting devices by any stated method.
CO2:. Implement circuit and test the performance.
CO3: Analyze small signal model of FET and MOSFET.

CO4: Explain behavior of FET at low frequency.
CO5: Design an adjustable voltage regulator circuits.

204183 :Electrical Circuits and Machines
CO1: Analyze basic AC & DC circuit for voltage, current and power by using KVL, KCL, and network theorems.
CO2: Explain the working principle of different electrical machines.
CO3: Select proper electrical motor for given application.
CO4: Design and analyze transformers.

204184 : Data Structures and Algorithms
CO1: Discuss the computational efficiency of the principal algorithms such as sorting & searching.
CO2: Write and understand the programs that use arrays & pointers in C
CO3: Describe how arrays, records, linked structures are represented in memory and use them in algorithms.
CO4: Implement stacks & queues for various applications.
CO5: Understand various terminologies and traversals of trees and use them for various applications.
CO6: Understand various terminologies and traversals of graphs and use them for various applications

204185 : Digital Electronics
CO1: Use the basic logic gates and various reduction techniques of digital logic circuit in detail.
CO2: Design combinational and sequential circuits.
CO3: Design and implement hardware circuit to test performance and application.
CO4: Understand the architecture and use of microcontrollers for basic operations and Simulate using simulation software.

204186: Electronic Measuring Instruments and Tools
CO1: Understand fundamental of various electrical measurements.
CO2: Understand and describe specifications, features and capabilities of electronic instruments.
CO3: Finalize the specifications of instrument and select an appropriate instrument for given measurement.
CO4: Carry out required measurement using various instruments under different setups.
CO5: Able to compare measuring instruments for performance parameters
CO6:Select appropriate instrument for the measurement of electrical parameter professionally.

204192: Audit course-I
Japanese Language module-I
CO1:will have ability of basic communication.
CO2:will have the knowledge of Japanese script.
CO3: will get introduced to reading , writing and listening skills
CO4:will develop interest to pursue professional Japanese Language course

204192 Audit Course-I
Road Safety Management

CO1:Changes in awareness levels, knowledge and understanding
CO2:A change in attitudes / behavior e.g. against drink-drive;
CO3:Casualty Reduction;
CO4:That remedial education for those who make mistakes and for low level offences where this is more effective than financial penalties and penalty points;
CO5: Improving Road Safety Together

SE Sem II

207005: Engineering Mathematics -III
CO1: Solve higher order linear differential equation using appropriate techniques for modeling and analyzing electrical circuits.
CO2: Solve problems related to Fourier transform, Z-transform and applications to Communication systems and Signal processing.
CO3: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.
CO4: Perform vector differentiation and integration, analyze the vector fields and apply to Electro-Magnetic fields.
CO5: Analyze conformal mappings, transformations and perform contour integration of complex functions in the study of electrostatics and signal processing.

204187: Integrated Circuits
CO1:Understand the characteristics of IC and Op-Amp and identify the internal structure.
CO2: Understand and identify various manufacturing techniques.
CO3: Derive and determine various performances based parameters and their significance for Op-Amp.
CO4: Comply and verify parameters after exciting IC by any stated method.
CO5: Analyze and identify the closed loop stability considerations and I/O limitations.
CO6: Analyze and identify linear and nonlinear applications of Op-Amp.
CO7: Understand and verify results (levels of V & I) with hardware implementation.
CO8: Implement hardwired circuit to test performance and application for what it is being designed.
CO9: Understand and apply the functionalities of PLL to Frequency synthesizer, multiplier, FM, and AM demodulators

204188: Control Systems
CO1: Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.
CO2: Determine the (absolute) stability of a closed-loop control system.
CO3: Perform time domain and frequency domain analysis of control systems required for stability analysis.
CO4: Perform time domain and frequency domain correlation analysis.
CO5: Apply root-locus, Frequency Plots technique to analyze control systems.
CO6: Express and solve system equations in state variable form

204189 :Analog Communications
CO1: Understand and identify the fundamental concepts and various components of analogcommunication systems.
CO2: Explain signal to noise ratio, noise figure and noise temperature for single and cascaded

stages in a communication system.
CO3: Describe analog pulse modulation techniques and digital modulation technique.
CO4:Develop the ability to compare and contrast the strengths and weaknesses of variouscommunication systems

204190 :Object Oriented Programming
CO1: Describe the principles of object oriented programming.
CO2: Apply the concepts of data encapsulation, inheritance in C++.
CO3: Understand basic program constructs in Java
CO4: Apply the concepts of classes, methods and inheritance to write programs Java.
CO5:Use arrays, vectors and strings concepts and interfaces to write programs in Java.
CO6: Describe and use the concepts in Java to develop user friendly program

204191: EMPLOYABILITY SKILL DEVELOPMENT
CO1: Have skills and preparedness for aptitude tests.
CO2: Be equipped with essential communication skills (writing, verbal and non-verbal)
CO3: Master the presentation skill and be ready for facing interviews.
CO4: Build team and lead it for problem solving.

204193:Audit course-II
Japanese Language module II
CO1: will have ability of basic communication.
CO2: will have the knowledge of Japanese script.
CO3:will get introduced to reading , writing and listening skills
CO4:will develop interest to pursue professional Japanese Language course.

T.E Sem I

304181: Digital Communication
CO1: Understand working of waveform coding techniques and analyse their performance.
CO2:Analyze the performance of a baseband and pass band digital communication system in terms of error rate and spectral efficiency.
CO3: Perform the time and frequency domain analysis of the signals in a digital communication system.
CO4: Design of digital communication system.
CO5: Understand working of spread spectrum communication system and analyze its performance.

304182: Digital Signal Processing
CO1:Analyze the discrete time signals and system using different transform domain techniques.
CO2: Design and implement LTI filters for filtering different real world signals.
CO3: Develop different signal processing applications using DSP processor.

304183: Electromagnetics
CO1:Understand the basic mathematical concepts related to electromagnetic vector fields.

CO2: Apply the principles of electrostatics to the solutions of problems relating to electric field and electric potential, boundary conditions and electric energy density.
CO3: Apply the principles of magnetostatics to the solutions of problems relating to magnetic field and magnetic potential, boundary conditions and magnetic energy density.
CO4:Understand the concepts related to Faraday‘s law, induced emf and Maxwell‘s equations.
CO5: Apply Maxwell‘s equations to solutions of problems relating to transmission lines and uniform plane wave propagation.

304184: Microcontrollers
CO1: Learn importance of microcontroller in designing embedded application.
CO2:Learn use of hardware and software tools.
CO3: Develop interfacing to real world devices

304185: Mechatronics
CO1:Identification of key elements of mechatronics system and its representation in terms of block diagram
CO2: Understanding basic principal of Sensors and Transducer.
CO3:Able to prepare case study of the system given

304193: Electronic System Design
CO1: Apply the fundamental concepts and working principles of electronics devices to design
electronics systems.
CO2:Shall be able to interpret datasheets and thus select appropriate components and devices
CO3: Select appropriate transducer and signal conditioning circuit to design prototype of Data
Acquisition system.
CO4: Design an electronic system/sub-system and validate its performance by simulating the same.
CO5:Shall be able to use an EDA tool for circuit schematic and simulation.
CO6:Create, manage the database and query handling using suitable tools.

Audit Course 3
Japanese Language Audit Course
CO1:One will have the knowledge of Japanese script.
CO:2One will get introduced to reading , writing and listening skills.
CO3:One will develop interest to pursue professional Japanese Language course

TE Sem II
304186: Power Electronics
CO1:Design & implement a triggering / gate drive circuit for a power device
CO2:Understand, perform & analyze different controlled converters.
CO3:Evaluate battery backup time & design a battery charger.
CO4:Design & implement over voltage / over current protection circuit.

304187: Information Theory Coding Techniques and Communication Networks
CO1:Perform information theoretic analysis of communication system.
CO2: Design a data compression scheme using suitable source coding technique.
CO3: Design a channel coding scheme for a communication system.
CO4: Understand and apply fundamental principles of data communication and networking.
CO5:Apply flow and error control techniques in communication networks.

304188: Business Management
CO1: Get overview of Management Science aspects useful in business.
CO2:Get motivation for Entrepreneurship
CO3:Get Quality Aspects for Systematically Running the Business
CO4:To Develop Project Management aspect and Entrepreneurship Skills.

304189: Advanced Processors
CO1 : Describe the ARM microprocessor architectures and its feature.
CO2:Interface the advanced peripherals to ARM based microcontroller
CO3: Design embedded system with available resources.
CO4: Use of DSP Processors and resources for signal processing applications.

304190 :System Programming and Operating System
CO1:Demonstrate the knowledge of Systems Programming and Operating Systems
CO2:Formulate the Problem and develop the solution for same.
CO3:Compare and analyse the different implementation approach of system programming operating system abstractions.
CO4:Interpret various OS functions used in Linux / Ubuntu

304196: Employability Skills and Mini Project
CO1:Understand, plan and execute a Mini Project with team.
CO2:Implement electronic hardware by learning PCB artwork design, soldering techniques, testing and troubleshooting etc.
CO3: Prepare a technical report based on the Mini project.
CO4: Deliver technical seminar based on the Mini Project work carried out.

Audit Course 4
CO1: One will have ability of basic communication.
CO1: One will have the knowledge of Japanese script.
CO1: One will get introduced to reading , writing and listening skills Faculty of Engineering Savitribai Phule Pune University
CO1: One will develop interest to pursue professional Japanese Language course.

BE Sem I

404181:VLSI Design& Technology

CO1:Write effective HDL coding for digital design.
CO2: Apply knowledge of real time issues in digital design.
CO3: Model digital circuit with HDL, simulate, synthesis and prototype in PLDs.
CO4: Design CMOS circuits for specified applications.
CO5: Analyze various issues and constraints in design of an ASIC
CO6: Apply knowledge of testability in design and build self test circuit.

404182:Computer Networks & Security
CO1: Understand fundamental underlying principles of computer networking
CO2: Describe and analyze the hardware, software, components of a network and their interrelations.
CO3: Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies
CO4: Have a basic knowledge of installing and configuring networking applications.
CO5:Specify and identify deficiencies in existing protocols, and then go onto select new and better protocols.
CO6: Have a basic knowledge of the use of cryptography and network security.

404183: Radiation and Microwave Techniques
CO1: Differentiate various performance parameters of radiating elements.
CO2: Analyze various radiating elements and arrays.
CO3: Apply the knowledge of waveguide fundamentals in design of transmission lines.
CO4: Design and set up a system consisting of various passive microwave components.
CO5: Analyze tube based and solid state active devices along with their applications.
CO6: Measure various performance parameters of microwave components.

404184 Digital Image and Video Processing (Elective-I)
CO1: Develop and implement basic mathematical operations on digital images.
CO2: Analyze and solve image enhancement and image restoration problems.
CO3: Identify and design image processing techniques for object segmentation and recognition.
CO4: Represent objects and region of the image with appropriate method.
CO5: Apply 2-D data compression techniques for digital images.
CO6: Explore video signal representation and different algorithm for video processing.

404184 Embedded Systems and RTOS(Elective-I)
CO1:Understand design of embedded system
CO2:Use RTOS in embedded application
CO3:Use modern architecture for embedded system
CO4: Use Linux for embedded system development
CO5:Use open platform for embedded system development

404184: Internet of Things (Elective-I)
CO1:On completion of the course, student will be able to
CO2: Understand the various concepts, terminologies and architecture of IoT systems.

CO3:Use sensors and actuators for design of IoT.
CO4:Understand and apply various protocols for design of IoT systems
CO5: Use various techniques of data storage and analytics in IoT
CO6:Understand various applications of IoT

404185 :Electronic Product Design (Elective-II)
CO1:Understand various stages of hardware, software and PCBdesign.
CO2: Importance of product test &testspecifications.
CO3:Special design considerations and importance ofdocumentation.

404185: Artificial Intelligence (Elective II)
CO1:Design and implement key components of intelligent agents and expert systems.
CO2: To apply knowledge representation techniques and problem solving strategies to common
AI applications.
CO3:Applyand integrate various artificial intelligence techniques in intelligent system development as well as understand the importance of maintaining intelligent systems.
CO4:Build rule-based and other knowledge-intensive problem solvers.

404185: Electronics in Agriculture (Elective II)
CO1:Understand Role of computers & virtual instrumentation.
CO2:Provide communication solution for interpreting environmental parameters with Electronics systems.
CO3:Describe Instrument technology used in agriculture.
CO4:Apply knowledge of Electronics in Agriculture.
CO5:Understand Greenhouse Technology & Role of Electronics Governance.

BE Sem II

404189 :Mobile Communication
CO1: The student should be able to apply the concepts of telecommunication switching, traffic and networks.
CO2: The student should be able to analyze the telecommunication traffic.
CO3: The student should be able to analyze radio channel and cellular capacity.
CO4: The student should be able to explain and apply concepts of GSM and CDMA system.

404190: Broadband Communication Systems
CO:To Identify the basic elements of fiber optics communication link,sources ,detectors, fiber modes & configuration.
CO2: To identify various losses along the optical link ,identify distortion & degradation of signals and To design Analog Link and Digital link budget to achieve SNR and BER of an optical communication system.
CO3 :To learn fundamentals of Satellite Communication system, fundamentals of orbital mechanics
CO4 :To Carry out Satellite Link design for Up Link and Down Link

404191 :Machine Learning (Elective III)

CO1: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.
CO2:To mathematically analyze various machine learning approaches and paradigms.
CO3:To implement convolution neural networks in recognition applications.

404191:Audio and Speech Processing (Elective III)

CO1:Design and implement algorithms for processing speech and audio signals considering the properties of acoustic signals and human hearing.
CO2: Analyze speech signal to extract the characteristic of vocal tract (formants) and vocal cords (pitch).
CO3: Analyze speech signal for extracting LPC and MFCC Parameters of speech signal.
CO4: 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.

404191: Software Defined Radio (Elective III)

CO1:Compare SDR with traditional Hardware Radio HDR.
CO2:Implement modern wireless system based on OFDM, MIMO & Smart Antenna.
CO3:Build experiment with real wireless waveform and applications, accessing both PHY and
MAC, Compare SDR versus MATLAB and Hardware Radio
CO4: Work on open projects and explore their capability to build their own communication System.

404192: ROBOTICS (Elective-IV)

CO1: Familiar with the history, concept development and key components of robotics technologies.
CO2: Implement basic mathematics manipulations of spatial coordinate representation and transformation.
CO3:Solve basic robot forward and inverse kinematic problems
CO4:Understand and able to solve basic robotic dynamics, path planning and control problems

404194 :Renewable Energy Systems (Elective-IV)

CO1:Interpret energy reserves of India and potential of different energy sources.
CO2:Measure the solar radiation parameters and performance of different solar collectors.
CO3:Calculate different parameters of wind turbine rotor.
CO4:Implicit the importance and applications of geothermal and ocean energy.
CO5:Demonstrate knowledge in field of fuel cell and potential for power generation.

404193: Lab Practice -III (MC+BCS)

CO1: Students should be able to set up and perform experiment on telecommunication switching and mobile communication and optical communication system.
CO2: As a part of their term work, students should visit the MTSO office and hence should be able to understand and observe actual switching systems and mobile communication technology.

CO3: Students should be able to design and set up Analog Link and Digital link of an optical communication system.
CO4: Students should be able to Establish a direct communication link between Uplink Transmitter and Downlink Receiver using tone signal, To establish an AUDIO-VIDEO satellite link between Transmitter and Receiver, to find out the link failure.

404195: Project Stage II
CO1. Identify, formulate and design the solution for engineering problem by investigating the literature.
CO2. apply appropriate modern tools, technologies or multidisciplinary approach to produce engineering solutions which will be beneficial to society and environment.
CO3. Demonstrate the project and communicate effectively in team, apply ethical ergonomic, and safety constraints in the project work.
CO4. Demonstrate knowledge and understanding of engineering and management principles and use it for life-long learning.

Audit Course 6 (2): Environmental Issues And Disaster Management
CO1:To learn the different environmental issues and disasters.
CO2:To deal with problems associated with environment and effectively handle the disasters.

Modern Education Society's College of Engineering, Pune
Department of E&TC
COURSE OUTCOMES

2019 Course

SE Sem I

207005: Engineering Mathematics – III

CO1: Solve higher order linear differential equation using appropriate techniques for modelling, analyzing of electrical circuits and control systems.
CO2: Apply concept of Fourier transform & Z-transform and its applications to continuous & discrete systems, signal & image processing and communication systems.
CO3: 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.
CO4: Perform vector differentiation & integration, analyze the vector fields and apply to electro-magnetic fields & wave theory.
CO5: Analyze Complex functions, Conformal mappings, Contour integration applicable to electrostatics, digital filters, signal and image processing.

204181: Electronic Circuits

CO1: Assimilate the physics, characteristics and parameters of MOSFET towards its application as amplifier.
CO2: Design MOSFET amplifiers, with and without feedback, & MOSFET oscillators, for given specifications.
CO3: Analyze and assess the performance of linear and switching regulators, with their variants, towards applications in regulated power supplies.
CO4: Explain internal schematic of Op-Amp and define its performance parameters.
CO5: Design, Build and test Op-amp based analog signal processing and conditioning circuits towards various real time applications.
CO6: Understand and compare the principles of various data conversion techniques and PLL with their applications.

204182: Digital Circuits

CO1: Identify and prevent various hazards and timing problems in a digital design.
CO2: Use the basic logic gates and various reduction techniques of digital logic circuit.
CO3: Analyze, design and implement combinational logic circuits.
CO4: Analyze, design and implement sequential circuits.
CO5: Differentiate between Mealy and Moore machines.
CO6: Analyze digital system design using PLD.

204183: Electrical Circuits

CO1: Analyze the simple DC and AC circuit with circuit simplification techniques.
CO2: Formulate and analyze driven and source free RL and RC circuits.
CO3: Formulate & determine network parameters for given network and analyze the given network using Laplace Transform to find the network transfer function.
CO4: Explain construction, working and applications of DC Machines / Single Phase & Three Phase AC Motors.

CO5: Explain construction, working and applications of special purpose motors & understand motors used in electrical vehicles.
CO6: Analyze and select a suitable motor for different applications.

204184: Data Structures
CO1: Solve mathematical problems using C programming language.
CO2: Implement sorting and searching algorithms and calculate their complexity.
CO3: Develop applications of stack and queue using array.
CO4: Demonstrate applicability of Linked List.
CO5: Demonstrate applicability of nonlinear data structures - Binary Tree with respect to its time complexity.
CO6: Apply the knowledge of graph for solving the problems of spanning tree and shortest path algorithm

SE Sem II
204191: Signals & Systems
CO1: Identify, classify basic signals and perform operations on signals.
CO2: Identify, Classify the systems based on their properties in terms of input output relation and in terms of impulse response and will be able to determine the convolution between to signals.
CO3: Analyze and resolve the signals in frequency domain using Fourier series and Fourier Transform.
CO4: Resolve the signals in complex frequency domain using Laplace Transform, and will be able to apply and analyze the LTI systems using Laplace Transforms.
CO5: Define and Describe the probability, random variables and random signals. Compute the probability of a given event, model, compute the CDF and PDF.
CO6: Compute the mean, mean square, variance and standard deviation for given random variables using PDF.

204192: Control Systems
CO1: Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.
CO2: Determine the (absolute) stability of a closed-loop control system.
CO3: Perform time domain analysis of control systems required for stability analysis.
CO4: Perform frequency domain analysis of control systems required for stability analysis.
CO5: Apply root-locus, Frequency Plots technique to analyze control systems.
CO6: Express and solve system equations in state variable form.
CO7: Differentiate between various digital controllers and understand the role of the controllers in Industrial automation.

204193: Principles of Communication Systems
CO1: To compute & compare the bandwidth and transmission power requirements by analyzing time and frequency domain spectra of signal required for modulation schemes under study.
CO2: Describe and analyze the techniques of generation, transmission and reception of Amplitude Modulation Systems.
CO3: Explain generation and detection of FM systems and compare with AM systems.
CO4: Exhibit the importance of Sampling Theorem and correlate with Pulse Modulation technique (PAM, PWM, and PPM).

CO5: Characterize the quantization process and elaborate digital representation techniques (PCM, DPCM, DM and ADM).
CO6: Illustrate waveform coding, multiplexing and synchronization techniques and articulate their importance in baseband digital transmission.

204194: Object Oriented Programming
CO1: Describe the principles of object oriented programming.
CO2: Apply the concepts of data encapsulation, inheritance in C++.
CO3: Understand Operator overloading and friend functions in C++.
CO4: Apply the concepts of classes, methods inheritance and polymorphism to write programs C++. CO5: Apply Templates, Namespaces and Exception Handling concepts to write programs in C++. CO6: Describe and use of File handling in C++.

204199: Employbility Skills Development
CO1: Define personal and career goals using introspective skills and SWOC assessment. Outline and evaluate short-term and long-term goals.
CO2: Develop effective communication skills (listening, reading, writing, and speaking), self- management attributes, problem solving abilities and team working & building capabilities in order to fetch employment opportunities and further succeed in the workplace.
CO3: Be a part of a multi-cultural professional environment and work effectively by enhancing inter-personal relationships, conflict management and leadership skills.
CO4: Comprehend the importance of professional ethics, etiquettes & morals and demonstrate sensitivity towards it throughout certified career.
CO5: Develop practically deployable skill set involving critical thinking, effective presentations and leadership qualities to hone the opportunities of employability and excel in the professional environment.

204200: Project Based Learning
CO1: Identify the real-world problem (possibly of interdisciplinary nature) through a rigorous literature survey and formulate / set relevant aim and objectives.
CO2: Contribute to society through proposed solution by strictly following professional ethics and safety measures.
CO3: Propose a suitable solution based on the fundamentals of electronics and communication engineering by possibly the integration of previously acquired knowledge.
CO4: Analyze the results and arrive at valid conclusion.
CO5: Use of technology in proposed work and demonstrate learning in oral and written form.
CO6: Develop ability to work as an individual and as a team member.

204198: Data Analytics Lab
CO1: Install Python Jupyter and write programs using NumPy, Pandas, Matplotlib and Scikit-learn.
CO2. Write programs related to 1D and 2D arrays
CO3. Write programs using data seriesproject related to data analytics
CO4. Write programs using data frames
CO5. Write programs to visualize output using various graphs and plots
CO6. Complete an end to end project related to data analytics

TE Sem I
304181: Digital Communication
CO1: Apply the statistical theory for describing various signals in a communication system.

CO2: Understand and explain various digital modulation techniques used in digital communication systems and analyze their performance in presence of AWGN noise.
CO3: Describe and analyze the digital communication system with spread spectrum modulation.
CO4: Analyze a communication system using information theoretic approach.
CO5: Use error control coding techniques to improve performance of a digital communication system.

304182: Electromagnetic Field Theory
CO1: Apply the basic electromagnetic principles and determine the fields (E & H) due to the given source.
CO2: Apply boundary conditions to the boundaries between various media to interpret behavior of the fields on either sides.
CO3: State, Identify and Apply Maxwell's equations (integral and differential forms) in both the forms (Static, time-varying or Time-harmonic field) for various sources, Calculate the time average power density using Poynting Theorem, Retarded magnetic vector potential.
CO4: Formulate, Interpret and solve simple uniform plane wave (Helmholtz Equations) equations, and analyze the incident/reflected/transmitted waves at normal incidence.
CO5: Interpret and Apply the transmission line equation to transmission line problems with load impedance to determine input and output voltage/current at any point on the Transmission line, Find input/load impedance, input/load admittance, reflection coefficient, SWR, Vmax/Vmin, length of transmission line using Smith Chart.
CO6: Carry out a detailed study, interpret the relevance and applications of Electromagnetics

304183: Database Management
CO1: Ability to implement the underlying concepts of a database system.
CO2: Design and implement a database schema for a given problem-domain using data model.
CO3: Formulate, using SQL/DML/DDL commands, solutions to a wide range of query and update problems.
CO4: Implement transactions, concurrency control, and be able to do Database recovery.
CO5: Able to understand various Parallel Database Architectures and its applications.
CO6: Able to understand various Distributed Databases and its applications.

304184: Microcontroller
CO1: Understand the fundamentals of microcontroller and programming.
CO2: Interface various electronic components with microcontrollers.
CO3: Analyze the features of PIC 18F XXXX.
CO4: Describe the programming details in peripheral support.
CO5: Develop interfacing models according to applications.
CO6: Evaluate the serial communication details and interfaces.

304185 (A): Digital Signal Processing (Elective -I)
CO1: Interpret and process discrete/ digital signals and represent DSP system.
CO2: Analyze the digital systems using the Z-transform techniques.
CO3: Implement efficient transform and its application to analyze DT signals.
CO4: Design and implement IIR filters.
CO5: Design and implement FIR filters.
CO6: Apply DSP techniques for speech/ biomedical/ image signal processing.

304185 (C): Fundamentals of JAVA Programming (Elective -I)
CO1: Understand the basic principles of Java programming language
CO2: Apply the concepts of classes and objects to write programsin Java
CO3: Demonstrate the concepts of methods & Inheritance
CO4: Use the concepts of interfaces & packages for program implementation
CO5: Understand multithreading and Exception handling in Java to develop robust programs
CO6: Use Graphics class, AWT packages and manage input and output files in Java

304185 (D): Computer Networks(Elective -I)
CO1: Design LAN using appropriate networking architecture, topologies, transmission media, and networking devices.
CO2: Understand the working of controlling techniques for flawless data communication using data link layer protocols.
CO3: Learn the functions of network layer, various switching techniques and internet protocol addressing.
CO4: Explore various interior and exterior, unicasting and multicasting protocols.
CO5: Analyze data flow using TCP/UDP Protocols, congestion control techniques for QoS.
CO6: Illustrate the use of protocols at application layer.

304190: Skill Development
CO1: Student should recognize the need to engage in independent and life-long learning in required skill sets
CO2: Student needs to experience the impact of industries on society by visiting different industries and understand the importance of industrial products for analog and digital circuits and systems.
CO3: Student has to make use of the modern electronic and IT Engineering Tools and Technologies for solving electronic engineering problems.
CO4: Student would be able to communicate effectively at different technical and administrative levels.
CO5: Student will exhibit leadership skills both as an individual and as a member in a team in multidisciplinary environment.

304191A: Mandatory Audit Course 5
CO1:To know about various aspects of soft skills and learn ways to develop personality Leadership, team building,decision making and stress management
CO2:Find out engineering solutions to meet the environmental standards set by legislation.
CO3:Understand how the urbanization proceeds in the right path causing minimum impact on environment.
CO4:how to manage water resources, design conservation strategies, and develop energy and transportation policies that improve society and the environment.

TE Sem II
304192: Cellular Networks
CO1: Understand fundamentals of wireless communications.
CO2: Discuss and study OFDM and MIMO concepts.
CO3: Elaborate fundamentals mobile communication.
CO4: Describes aspects of wireless system planning.
CO5: Understand of modern and futuristic wireless networks architecture.
CO6: Summarize different issues in performance analysis.

304193: Project Management

CO1: Apply the fundamental knowledge of project management for effectively handling the projects. CO2: Identify and select the appropriate project based on feasibility study and undertake its effective planning.

CO3: Assimilate effectively within the organizational structure of project and handle project management related issues in an efficient manner.

CO4: Apply the project scheduling techniques to create a Project Schedule Plan and accordingly utilize the resources to meet the project deadline.

CO5: Identify and assess the project risks and manage finances in line with Project Financial Management Process.

CO6: Develop new products assessing their commercial viability and develop skillsets for becoming successful entrepreneurs while being fully aware of the legal issues related to Product development and Entrepreneurship.

304194: Power Devices & Circuits

CO1: To differentiate based on the characteristic parameters among SCR, GTO, MOSFET & IGBT and identify suitability of the power device for certain applications and understand the significance of device ratings.

CO2: To design triggering / driver circuits for various power devices.

CO3: To evaluate and analyze various performance parameters of the different converters and its topologies.

CO4: To understand significance and design of various protections circuits for power devices.

CO5: To evaluate the performance of uninterruptible power supplies, switch mode power supplies and battery.

CO6: To understand case studies of power electronics in applications like electric vehicles, solar systems etc.

304195 (A): Digital Image Processing (Elective -II)

CO1: Apply knowledge of mathematics for image understanding and analysis.

CO2: Implement spatial domain image operations.

CO3: Design and realize various algorithms for image segmentation.

CO4: Design and realize various algorithms for image Compression.

CO5: Apply restoration to remove noise in the image.

CO6: Describe the object recognition system.

304195 (C): Advanced JAVA Programming (Elective -II)

CO1: Design and develop GUI applications using Applets.

CO2: Apply relevant AWT/ swing components to handle the given event.

CO3: Design and develop GUI applications using Abstract Windowing Toolkit (AWT), Swing and Event Handling.

CO4: Learn to access database through Java programs, using Java Database Connectivity (JDBC)

CO5: Invoke the remote methodsin an application using Remote Method Invocation (RMI)

CO6: Develop program for client /server communication using Java Networking classes.

304199: Internship

CO1: To develop professional competence through internship.

CO2: To apply academic knowledge in a personal and professional environment.

CO3: To build the professional network and expose students to future employees.
CO4: Apply professional and societal ethics in their day to day life.
CO5: To become a responsible professional having social, economic and administrative considerations.
CO6: To make own career goals and personal aspirations

304200: Mini Project
CO1: Understand, plan and execute a Mini Project with team.
CO2: Implement electronic hardware by learning PCB artwork design, soldering techniques, testing and troubleshooting etc.
CO3: Prepare a technical report based on the Mini project.
CO 4: Deliver technical seminar based on the Mini Project work carried out.

BE Sem I
404181:Radiation & Microwave Theory
CO1: Apply the fundamentals of electromagnetic to derive free space propagation equation and distinguish various performance parameters of antenna.
CO2: Identify various modes in the waveguide. Compare: coaxial line, rectangular waveguides & striplines and identify applications of the same.
CO3: Explore construction and working of principles passive microwave devices/components.
CO4: Explore construction and working of principles active microwave devices/components.
CO5: Analyze the structure, characteristics, operation, equivalent circuits and applications of various microwave solid state active devices.
CO6: Know the various microwave systems, device set ups of microwave measurement devices and Identify the effect of radiations on environmental sustainability.

404182: VLSI Design and Technology
CO1: Develop effective HDL codes for digital design.
CO2: Apply knowledge of real time issues in digital design.
CO3: Model digital circuit with HDL, simulate, synthesis and prototype in PLDs.
CO4: Design CMOS circuits for specified applications.
CO5: Analyze various issues and constraints in design of an ASIC.
CO6: Apply knowledge of testability in design and Build In Self Test (BIST) circuit.

404183: Cloud Computing
CO1: Understand the basic concepts of Cloud Computing.
CO2: Describe the underlying principles of different Cloud Service Models.
CO3: Classify the types of Virtualization.
CO4: Examine the Cloud Architecture and understand the importance of Cloud Security.
CO5: Develop applications on Cloud Platforms.
CO6: Evaluate distributed computing and the Internet of Things.

404184: Elective-3
JAVA Script
CO1: Use basic features of java script.
CO2: Use relevant data types for developing application in java script.
CO3: Use the function and objects as self-contained, with data passing in and out through well-defined interfaces in development of small systems.
CO4: Apply the regular expression for Text matching and manipulation.

CO5: Explore use of the various aspects of JavaScript object models that are fundamental to the proper use of the language.
CO6: Develop the application using windows controlling and form handling.

Embedded & RTOS
CO1: Apply design metrics of Embedded systems to design real time applications to match recent trends in technology.
CO2: Apply Real time systems concepts.
CO3: Evaluate μCOS operating system and its services.
CO4: Apply Embedded Linux Development Environment and testing tools.
CO5: Analyze Linux operating system and device drivers.
CO6: Analyze the hardware – software co design issues for testing of real time Embedded system.

404185: Elective - 4
Deep Learning
CO1: Classify machine learning algorithms and its types
CO2: Discuss the concepts of deep learning and its Frameworks.
CO3: Identify the deep learning architecture with respect to the applications.
CO4: Demonstrate different architectures of Convolutional neural networks.
CO5: Discuss natural language processing architecture.
CO6: Make use of various case studies and Deep learning applications.
Data Mining
CO1: Understand the process of data mining and performance issues in data mining.
CO2: Apply data preprocessing techniques to the historical data collected in data warehouse
CO3: Analyze various types of Frequent pattern analysis methods and advanced Pattern mining techniques
CO4: Evaluate various data mining algorithms for developing effective data mining models
CO5: Analyze different clustering and outlier detection methods
CO6: Design data mining models in different mining application areas

2015 course

SE Sem I

204181: Signals and Systems
CO1: Understand mathematical description and representation of continuous and discrete time signals and systems.
CO2: Develop input output relationship for linear shift invariant system and understand the convolution operator for continuous and discrete time system.
CO3: Understand and resolve the signals in frequency domain using Fourier series and Fourier transforms.
CO4: Understand the limitations of Fourier transform and need for Laplace transform and develop the ability to analyze the system in s- domain.
CO5: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
CO1: Comply and verify parameters after exciting devices by any stated method.
CO2:. Implement circuit and test the performance.
CO3: Analyze small signal model of FET and MOSFET.

CO4: Explain behavior of FET at low frequency.
CO5: Design an adjustable voltage regulator circuits.

204183 :Electrical Circuits and Machines
CO1: Analyze basic AC & DC circuit for voltage, current and power by using KVL, KCL, and network theorems.
CO2: Explain the working principle of different electrical machines.
CO3: Select proper electrical motor for given application.
CO4: Design and analyze transformers.

204184 : Data Structures and Algorithms
CO1: Discuss the computational efficiency of the principal algorithms such as sorting & searching.
CO2: Write and understand the programs that use arrays & pointers in C
CO3: Describe how arrays, records, linked structures are represented in memory and use them in algorithms.
CO4: Implement stacks & queues for various applications.
CO5: Understand various terminologies and traversals of trees and use them for various applications.
CO6: Understand various terminologies and traversals of graphs and use them for various applications

204185 : Digital Electronics
CO1: Use the basic logic gates and various reduction techniques of digital logic circuit in detail.
CO2: Design combinational and sequential circuits.
CO3: Design and implement hardware circuit to test performance and application.
CO4: Understand the architecture and use of microcontrollers for basic operations and Simulate using simulation software.

204186: Electronic Measuring Instruments and Tools
CO1: Understand fundamental of various electrical measurements.
CO2: Understand and describe specifications, features and capabilities of electronic instruments.
CO3: Finalize the specifications of instrument and select an appropriate instrument for given measurement.
CO4: Carry out required measurement using various instruments under different setups.
CO5: Able to compare measuring instruments for performance parameters
CO6:Select appropriate instrument for the measurement of electrical parameter professionally.

204192: Audit course-I
Japanese Language module-I
CO1:will have ability of basic communication.
CO2:will have the knowledge of Japanese script.
CO3: will get introduced to reading , writing and listening skills
CO4:will develop interest to pursue professional Japanese Language course

204192 Audit Course-I
Road Safety Management

CO1:Changes in awareness levels, knowledge and understanding
CO2:A change in attitudes / behavior e.g. against drink-drive;
CO3:Casualty Reduction;
CO4:That remedial education for those who make mistakes and for low level offences where this is more effective than financial penalties and penalty points;
CO5: Improving Road Safety Together

SE Sem II

207005: Engineering Mathematics -III
CO1: Solve higher order linear differential equation using appropriate techniques for modeling and analyzing electrical circuits.
CO2: Solve problems related to Fourier transform, Z-transform and applications to Communication systems and Signal processing.
CO3: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.
CO4: Perform vector differentiation and integration, analyze the vector fields and apply to Electro-Magnetic fields.
CO5: Analyze conformal mappings, transformations and perform contour integration of complex functions in the study of electrostatics and signal processing.

204187: Integrated Circuits
CO1:Understand the characteristics of IC and Op-Amp and identify the internal structure.
CO2: Understand and identify various manufacturing techniques.
CO3: Derive and determine various performances based parameters and their significance for Op-Amp.
CO4: Comply and verify parameters after exciting IC by any stated method.
CO5: Analyze and identify the closed loop stability considerations and I/O limitations.
CO6: Analyze and identify linear and nonlinear applications of Op-Amp.
CO7: Understand and verify results (levels of V & I) with hardware implementation.
CO8: Implement hardwired circuit to test performance and application for what it is being designed.
CO9: Understand and apply the functionalities of PLL to Frequency synthesizer, multiplier, FM, and AM demodulators

204188: Control Systems
CO1: Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.
CO2: Determine the (absolute) stability of a closed-loop control system.
CO3: Perform time domain and frequency domain analysis of control systems required for stability analysis.
CO4: Perform time domain and frequency domain correlation analysis.
CO5: Apply root-locus, Frequency Plots technique to analyze control systems.
CO6: Express and solve system equations in state variable form

204189 :Analog Communications
CO1: Understand and identify the fundamental concepts and various components of analogcommunication systems.
CO2: Explain signal to noise ratio, noise figure and noise temperature for single and cascaded

stages in a communication system.
CO3: Describe analog pulse modulation techniques and digital modulation technique.
CO4:Develop the ability to compare and contrast the strengths and weaknesses of variouscommunication systems

204190 :Object Oriented Programming
CO1: Describe the principles of object oriented programming.
CO2: Apply the concepts of data encapsulation, inheritance in C++.
CO3: Understand basic program constructs in Java
CO4: Apply the concepts of classes, methods and inheritance to write programs Java.
CO5:Use arrays, vectors and strings concepts and interfaces to write programs in Java.
CO6: Describe and use the concepts in Java to develop user friendly program

204191: EMPLOYABILITY SKILL DEVELOPMENT
CO1: Have skills and preparedness for aptitude tests.
CO2: Be equipped with essential communication skills (writing, verbal and non-verbal)
CO3: Master the presentation skill and be ready for facing interviews.
CO4: Build team and lead it for problem solving.

204193:Audit course-II
Japanese Language module II
CO1: will have ability of basic communication.
CO2: will have the knowledge of Japanese script.
CO3:will get introduced to reading , writing and listening skills
CO4:will develop interest to pursue professional Japanese Language course.

T.E Sem I

304181: Digital Communication
CO1: Understand working of waveform coding techniques and analyse their performance.
CO2:Analyze the performance of a baseband and pass band digital communication system in terms of error rate and spectral efficiency.
CO3: Perform the time and frequency domain analysis of the signals in a digital communication system.
CO4: Design of digital communication system.
CO5: Understand working of spread spectrum communication system and analyze its performance.

304182: Digital Signal Processing
CO1:Analyze the discrete time signals and system using different transform domain techniques.
CO2: Design and implement LTI filters for filtering different real world signals.
CO3: Develop different signal processing applications using DSP processor.

304183: Electromagnetics
CO1:Understand the basic mathematical concepts related to electromagnetic vector fields.

CO2: Apply the principles of electrostatics to the solutions of problems relating to electric field and electric potential, boundary conditions and electric energy density.
CO3: Apply the principles of magnetostatics to the solutions of problems relating to magnetic field and magnetic potential, boundary conditions and magnetic energy density.
CO4:Understand the concepts related to Faraday‘s law, induced emf and Maxwell‘s equations.
CO5: Apply Maxwell‘s equations to solutions of problems relating to transmission lines and uniform plane wave propagation.

304184: Microcontrollers
CO1: Learn importance of microcontroller in designing embedded application.
CO2:Learn use of hardware and software tools.
CO3: Develop interfacing to real world devices

304185: Mechatronics
CO1:Identification of key elements of mechatronics system and its representation in terms of block diagram
CO2: Understanding basic principal of Sensors and Transducer.
CO3:Able to prepare case study of the system given

304193: Electronic System Design
CO1: Apply the fundamental concepts and working principles of electronics devices to design
electronics systems.
CO2:Shall be able to interpret datasheets and thus select appropriate components and devices
CO3: Select appropriate transducer and signal conditioning circuit to design prototype of Data
Acquisition system.
CO4: Design an electronic system/sub-system and validate its performance by simulating the same.
CO5:Shall be able to use an EDA tool for circuit schematic and simulation.
CO6:Create, manage the database and query handling using suitable tools.

Audit Course 3
Japanese Language Audit Course
CO1:One will have the knowledge of Japanese script.
CO:2One will get introduced to reading , writing and listening skills.
CO3:One will develop interest to pursue professional Japanese Language course

TE Sem II
304186: Power Electronics
CO1:Design & implement a triggering / gate drive circuit for a power device
CO2:Understand, perform & analyze different controlled converters.
CO3:Evaluate battery backup time & design a battery charger.
CO4:Design & implement over voltage / over current protection circuit.

304187: Information Theory Coding Techniques and Communication Networks
CO1:Perform information theoretic analysis of communication system.
CO2: Design a data compression scheme using suitable source coding technique.
CO3: Design a channel coding scheme for a communication system.
CO4: Understand and apply fundamental principles of data communication and networking.
CO5:Apply flow and error control techniques in communication networks.

304188: Business Management
CO1: Get overview of Management Science aspects useful in business.
CO2:Get motivation for Entrepreneurship
CO3:Get Quality Aspects for Systematically Running the Business
CO4:To Develop Project Management aspect and Entrepreneurship Skills.

304189: Advanced Processors
CO1 : Describe the ARM microprocessor architectures and its feature.
CO2:Interface the advanced peripherals to ARM based microcontroller
CO3: Design embedded system with available resources.
CO4: Use of DSP Processors and resources for signal processing applications.

304190 :System Programming and Operating System
CO1:Demonstrate the knowledge of Systems Programming and Operating Systems
CO2:Formulate the Problem and develop the solution for same.
CO3:Compare and analyse the different implementation approach of system programming operating system abstractions.
CO4:Interpret various OS functions used in Linux / Ubuntu

304196: Employability Skills and Mini Project
CO1:Understand, plan and execute a Mini Project with team.
CO2:Implement electronic hardware by learning PCB artwork design, soldering techniques, testing and troubleshooting etc.
CO3: Prepare a technical report based on the Mini project.
CO4: Deliver technical seminar based on the Mini Project work carried out.

Audit Course 4
CO1: One will have ability of basic communication.
CO1: One will have the knowledge of Japanese script.
CO1: One will get introduced to reading , writing and listening skills Faculty of Engineering Savitribai Phule Pune University
CO1: One will develop interest to pursue professional Japanese Language course.

BE Sem I

404181:VLSI Design& Technology

CO1:Write effective HDL coding for digital design.
CO2: Apply knowledge of real time issues in digital design.
CO3: Model digital circuit with HDL, simulate, synthesis and prototype in PLDs.
CO4: Design CMOS circuits for specified applications.
CO5: Analyze various issues and constraints in design of an ASIC
CO6: Apply knowledge of testability in design and build self test circuit.

404182:Computer Networks & Security
CO1: Understand fundamental underlying principles of computer networking
CO2: Describe and analyze the hardware, software, components of a network and their interrelations.
CO3: Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies
CO4: Have a basic knowledge of installing and configuring networking applications.
CO5:Specify and identify deficiencies in existing protocols, and then go onto select new and better protocols.
CO6: Have a basic knowledge of the use of cryptography and network security.

404183: Radiation and Microwave Techniques
CO1: Differentiate various performance parameters of radiating elements.
CO2: Analyze various radiating elements and arrays.
CO3: Apply the knowledge of waveguide fundamentals in design of transmission lines.
CO4: Design and set up a system consisting of various passive microwave components.
CO5: Analyze tube based and solid state active devices along with their applications.
CO6: Measure various performance parameters of microwave components.

404184 Digital Image and Video Processing (Elective-I)
CO1: Develop and implement basic mathematical operations on digital images.
CO2: Analyze and solve image enhancement and image restoration problems.
CO3: Identify and design image processing techniques for object segmentation and recognition.
CO4: Represent objects and region of the image with appropriate method.
CO5: Apply 2-D data compression techniques for digital images.
CO6: Explore video signal representation and different algorithm for video processing.

404184 Embedded Systems and RTOS(Elective-I)
CO1:Understand design of embedded system
CO2:Use RTOS in embedded application
CO3:Use modern architecture for embedded system
CO4: Use Linux for embedded system development
CO5:Use open platform for embedded system development

404184: Internet of Things (Elective-I)
CO1:On completion of the course, student will be able to
CO2: Understand the various concepts, terminologies and architecture of IoT systems.

CO3:Use sensors and actuators for design of IoT.
CO4:Understand and apply various protocols for design of IoT systems
CO5: Use various techniques of data storage and analytics in IoT
CO6:Understand various applications of IoT

404185 :Electronic Product Design (Elective-II)
CO1:Understand various stages of hardware, software and PCBdesign.
CO2: Importance of product test &testspecifications.
CO3:Special design considerations and importance ofdocumentation.

404185: Artificial Intelligence (Elective II)
CO1:Design and implement key components of intelligent agents and expert systems.
CO2: To apply knowledge representation techniques and problem solving strategies to common
AI applications.
CO3:Applyand integrate various artificial intelligence techniques in intelligent system development as well as understand the importance of maintaining intelligent systems.
CO4:Build rule-based and other knowledge-intensive problem solvers.

404185: Electronics in Agriculture (Elective II)
CO1:Understand Role of computers & virtual instrumentation.
CO2:Provide communication solution for interpreting environmental parameters with Electronics systems.
CO3:Describe Instrument technology used in agriculture.
CO4:Apply knowledge of Electronics in Agriculture.
CO5:Understand Greenhouse Technology & Role of Electronics Governance.

BE Sem II

404189 :Mobile Communication
CO1: The student should be able to apply the concepts of telecommunication switching, traffic and networks.
CO2: The student should be able to analyze the telecommunication traffic.
CO3: The student should be able to analyze radio channel and cellular capacity.
CO4: The student should be able to explain and apply concepts of GSM and CDMA system.

404190: Broadband Communication Systems
CO:To Identify the basic elements of fiber optics communication link,sources ,detectors, fiber modes & configuration.
CO2: To identify various losses along the optical link ,identify distortion & degradation of signals and To design Analog Link and Digital link budget to achieve SNR and BER of an optical communication system.
CO3 :To learn fundamentals of Satellite Communication system, fundamentals of orbital mechanics
CO4 :To Carry out Satellite Link design for Up Link and Down Link

404191 :Machine Learning (Elective III)

CO1: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.
CO2:To mathematically analyze various machine learning approaches and paradigms.
CO3:To implement convolution neural networks in recognition applications.

404191:Audio and Speech Processing (Elective III)

CO1:Design and implement algorithms for processing speech and audio signals considering the properties of acoustic signals and human hearing.
CO2: Analyze speech signal to extract the characteristic of vocal tract (formants) and vocal cords (pitch).
CO3: Analyze speech signal for extracting LPC and MFCC Parameters of speech signal.
CO4: 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.

404191: Software Defined Radio (Elective III)

CO1:Compare SDR with traditional Hardware Radio HDR.
CO2:Implement modern wireless system based on OFDM, MIMO & Smart Antenna.
CO3:Build experiment with real wireless waveform and applications, accessing both PHY and
MAC, Compare SDR versus MATLAB and Hardware Radio
CO4: Work on open projects and explore their capability to build their own communication System.

404192: ROBOTICS (Elective-IV)

CO1: Familiar with the history, concept development and key components of robotics technologies.
CO2: Implement basic mathematics manipulations of spatial coordinate representation and transformation.
CO3:Solve basic robot forward and inverse kinematic problems
CO4:Understand and able to solve basic robotic dynamics, path planning and control problems

404194 :Renewable Energy Systems (Elective-IV)

CO1:Interpret energy reserves of India and potential of different energy sources.
CO2:Measure the solar radiation parameters and performance of different solar collectors.
CO3:Calculate different parameters of wind turbine rotor.
CO4:Implicit the importance and applications of geothermal and ocean energy.
CO5:Demonstrate knowledge in field of fuel cell and potential for power generation.

404193: Lab Practice -III (MC+BCS)

CO1: Students should be able to set up and perform experiment on telecommunication switching and mobile communication and optical communication system.
CO2: As a part of their term work, students should visit the MTSO office and hence should be able to understand and observe actual switching systems and mobile communication technology.

CO3: Students should be able to design and set up Analog Link and Digital link of an optical communication system.
CO4: Students should be able to Establish a direct communication link between Uplink Transmitter and Downlink Receiver using tone signal, To establish an AUDIO-VIDEO satellite link between Transmitter and Receiver, to find out the link failure.

404195: Project Stage II
CO1. Identify, formulate and design the solution for engineering problem by investigating the literature.
CO2. apply appropriate modern tools, technologies or multidisciplinary approach to produce engineering solutions which will be beneficial to society and environment.
CO3. Demonstrate the project and communicate effectively in team, apply ethical ergonomic, and safety constraints in the project work.
CO4. Demonstrate knowledge and understanding of engineering and management principles and use it for life-long learning.

Audit Course 6 (2): Environmental Issues And Disaster Management
CO1:To learn the different environmental issues and disasters.
CO2:To deal with problems associated with environment and effectively handle the disasters.

Modern Education Society's College of Engineering, Pune
Department of E&TC
COURSE OUTCOMES

2019 Course

SE Sem I

207005: Engineering Mathematics – III

CO1: Solve higher order linear differential equation using appropriate techniques for modelling, analyzing of electrical circuits and control systems.
CO2: Apply concept of Fourier transform & Z-transform and its applications to continuous & discrete systems, signal & image processing and communication systems.
CO3: 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.
CO4: Perform vector differentiation & integration, analyze the vector fields and apply to electro-magnetic fields & wave theory.
CO5: Analyze Complex functions, Conformal mappings, Contour integration applicable to electrostatics, digital filters, signal and image processing.

204181: Electronic Circuits

CO1: Assimilate the physics, characteristics and parameters of MOSFET towards its application as amplifier.
CO2: Design MOSFET amplifiers, with and without feedback, & MOSFET oscillators, for given specifications.
CO3: Analyze and assess the performance of linear and switching regulators, with their variants, towards applications in regulated power supplies.
CO4: Explain internal schematic of Op-Amp and define its performance parameters.
CO5: Design, Build and test Op-amp based analog signal processing and conditioning circuits towards various real time applications.
CO6: Understand and compare the principles of various data conversion techniques and PLL with their applications.

204182: Digital Circuits

CO1: Identify and prevent various hazards and timing problems in a digital design.
CO2: Use the basic logic gates and various reduction techniques of digital logic circuit.
CO3: Analyze, design and implement combinational logic circuits.
CO4: Analyze, design and implement sequential circuits.
CO5: Differentiate between Mealy and Moore machines.
CO6: Analyze digital system design using PLD.

204183: Electrical Circuits

CO1: Analyze the simple DC and AC circuit with circuit simplification techniques.
CO2: Formulate and analyze driven and source free RL and RC circuits.
CO3: Formulate & determine network parameters for given network and analyze the given network using Laplace Transform to find the network transfer function.
CO4: Explain construction, working and applications of DC Machines / Single Phase & Three Phase AC Motors.

CO5: Explain construction, working and applications of special purpose motors & understand motors used in electrical vehicles.
CO6: Analyze and select a suitable motor for different applications.

204184: Data Structures
CO1: Solve mathematical problems using C programming language.
CO2: Implement sorting and searching algorithms and calculate their complexity.
CO3: Develop applications of stack and queue using array.
CO4: Demonstrate applicability of Linked List.
CO5: Demonstrate applicability of nonlinear data structures - Binary Tree with respect to its time complexity.
CO6: Apply the knowledge of graph for solving the problems of spanning tree and shortest path algorithm

SE Sem II
204191: Signals & Systems
CO1: Identify, classify basic signals and perform operations on signals.
CO2: Identify, Classify the systems based on their properties in terms of input output relation and in terms of impulse response and will be able to determine the convolution between to signals.
CO3: Analyze and resolve the signals in frequency domain using Fourier series and Fourier Transform.
CO4: Resolve the signals in complex frequency domain using Laplace Transform, and will be able to apply and analyze the LTI systems using Laplace Transforms.
CO5: Define and Describe the probability, random variables and random signals. Compute the probability of a given event, model, compute the CDF and PDF.
CO6: Compute the mean, mean square, variance and standard deviation for given random variables using PDF.

204192: Control Systems
CO1: Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.
CO2: Determine the (absolute) stability of a closed-loop control system.
CO3: Perform time domain analysis of control systems required for stability analysis.
CO4: Perform frequency domain analysis of control systems required for stability analysis.
CO5: Apply root-locus, Frequency Plots technique to analyze control systems.
CO6: Express and solve system equations in state variable form.
CO7: Differentiate between various digital controllers and understand the role of the controllers in Industrial automation.

204193: Principles of Communication Systems
CO1: To compute & compare the bandwidth and transmission power requirements by analyzing time and frequency domain spectra of signal required for modulation schemes under study.
CO2: Describe and analyze the techniques of generation, transmission and reception of Amplitude Modulation Systems.
CO3: Explain generation and detection of FM systems and compare with AM systems.
CO4: Exhibit the importance of Sampling Theorem and correlate with Pulse Modulation technique (PAM, PWM, and PPM).

CO5: Characterize the quantization process and elaborate digital representation techniques (PCM, DPCM, DM and ADM).
CO6: Illustrate waveform coding, multiplexing and synchronization techniques and articulate their importance in baseband digital transmission.

204194: Object Oriented Programming
CO1: Describe the principles of object oriented programming.
CO2: Apply the concepts of data encapsulation, inheritance in C++.
CO3: Understand Operator overloading and friend functions in C++.
CO4: Apply the concepts of classes, methods inheritance and polymorphism to write programs C++. CO5: Apply Templates, Namespaces and Exception Handling concepts to write programs in C++. CO6: Describe and use of File handling in C++.

204199: Employbility Skills Development
CO1: Define personal and career goals using introspective skills and SWOC assessment. Outline and evaluate short-term and long-term goals.
CO2: Develop effective communication skills (listening, reading, writing, and speaking), self- management attributes, problem solving abilities and team working & building capabilities in order to fetch employment opportunities and further succeed in the workplace.
CO3: Be a part of a multi-cultural professional environment and work effectively by enhancing inter-personal relationships, conflict management and leadership skills.
CO4: Comprehend the importance of professional ethics, etiquettes & morals and demonstrate sensitivity towards it throughout certified career.
CO5: Develop practically deployable skill set involving critical thinking, effective presentations and leadership qualities to hone the opportunities of employability and excel in the professional environment.

204200: Project Based Learning
CO1: Identify the real-world problem (possibly of interdisciplinary nature) through a rigorous literature survey and formulate / set relevant aim and objectives.
CO2: Contribute to society through proposed solution by strictly following professional ethics and safety measures.
CO3: Propose a suitable solution based on the fundamentals of electronics and communication engineering by possibly the integration of previously acquired knowledge.
CO4: Analyze the results and arrive at valid conclusion.
CO5: Use of technology in proposed work and demonstrate learning in oral and written form.
CO6: Develop ability to work as an individual and as a team member.

204198: Data Analytics Lab
CO1: Install Python Jupyter and write programs using NumPy, Pandas, Matplotlib and Scikit-learn.
CO2. Write programs related to 1D and 2D arrays
CO3. Write programs using data seriesproject related to data analytics
CO4. Write programs using data frames
CO5. Write programs to visualize output using various graphs and plots
CO6. Complete an end to end project related to data analytics

TE Sem I
304181: Digital Communication
CO1: Apply the statistical theory for describing various signals in a communication system.

CO2: Understand and explain various digital modulation techniques used in digital communication systems and analyze their performance in presence of AWGN noise.
CO3: Describe and analyze the digital communication system with spread spectrum modulation.
CO4: Analyze a communication system using information theoretic approach.
CO5: Use error control coding techniques to improve performance of a digital communication system.

304182: Electromagnetic Field Theory
CO1: Apply the basic electromagnetic principles and determine the fields (E & H) due to the given source.
CO2: Apply boundary conditions to the boundaries between various media to interpret behavior of the fields on either sides.
CO3: State, Identify and Apply Maxwell's equations (integral and differential forms) in both the forms (Static, time-varying or Time-harmonic field) for various sources, Calculate the time average power density using Poynting Theorem, Retarded magnetic vector potential.
CO4: Formulate, Interpret and solve simple uniform plane wave (Helmholtz Equations) equations, and analyze the incident/reflected/transmitted waves at normal incidence.
CO5: Interpret and Apply the transmission line equation to transmission line problems with load impedance to determine input and output voltage/current at any point on the Transmission line, Find input/load impedance, input/load admittance, reflection coefficient, SWR, Vmax/Vmin, length of transmission line using Smith Chart.
CO6: Carry out a detailed study, interpret the relevance and applications of Electromagnetics

304183: Database Management
CO1: Ability to implement the underlying concepts of a database system.
CO2: Design and implement a database schema for a given problem-domain using data model.
CO3: Formulate, using SQL/DML/DDL commands, solutions to a wide range of query and update problems.
CO4: Implement transactions, concurrency control, and be able to do Database recovery.
CO5: Able to understand various Parallel Database Architectures and its applications.
CO6: Able to understand various Distributed Databases and its applications.

304184: Microcontroller
CO1: Understand the fundamentals of microcontroller and programming.
CO2: Interface various electronic components with microcontrollers.
CO3: Analyze the features of PIC 18F XXXX.
CO4: Describe the programming details in peripheral support.
CO5: Develop interfacing models according to applications.
CO6: Evaluate the serial communication details and interfaces.

304185 (A): Digital Signal Processing (Elective -I)
CO1: Interpret and process discrete/ digital signals and represent DSP system.
CO2: Analyze the digital systems using the Z-transform techniques.
CO3: Implement efficient transform and its application to analyze DT signals.
CO4: Design and implement IIR filters.
CO5: Design and implement FIR filters.
CO6: Apply DSP techniques for speech/ biomedical/ image signal processing.

304185 (C): Fundamentals of JAVA Programming (Elective -I)
CO1: Understand the basic principles of Java programming language
CO2: Apply the concepts of classes and objects to write programsin Java
CO3: Demonstrate the concepts of methods & Inheritance
CO4: Use the concepts of interfaces & packages for program implementation
CO5: Understand multithreading and Exception handling in Java to develop robust programs
CO6: Use Graphics class, AWT packages and manage input and output files in Java

304185 (D): Computer Networks(Elective -I)
CO1: Design LAN using appropriate networking architecture, topologies, transmission media, and networking devices.
CO2: Understand the working of controlling techniques for flawless data communication using data link layer protocols.
CO3: Learn the functions of network layer, various switching techniques and internet protocol addressing.
CO4: Explore various interior and exterior, unicasting and multicasting protocols.
CO5: Analyze data flow using TCP/UDP Protocols, congestion control techniques for QoS.
CO6: Illustrate the use of protocols at application layer.

304190: Skill Development
CO1: Student should recognize the need to engage in independent and life-long learning in required skill sets
CO2: Student needs to experience the impact of industries on society by visiting different industries and understand the importance of industrial products for analog and digital circuits and systems.
CO3: Student has to make use of the modern electronic and IT Engineering Tools and Technologies for solving electronic engineering problems.
CO4: Student would be able to communicate effectively at different technical and administrative levels.
CO5: Student will exhibit leadership skills both as an individual and as a member in a team in multidisciplinary environment.

304191A: Mandatory Audit Course 5
CO1:To know about various aspects of soft skills and learn ways to develop personality Leadership, team building,decision making and stress management
CO2:Find out engineering solutions to meet the environmental standards set by legislation.
CO3:Understand how the urbanization proceeds in the right path causing minimum impact on environment.
CO4:how to manage water resources, design conservation strategies, and develop energy and transportation policies that improve society and the environment.

TE Sem II
304192: Cellular Networks
CO1: Understand fundamentals of wireless communications.
CO2: Discuss and study OFDM and MIMO concepts.
CO3: Elaborate fundamentals mobile communication.
CO4: Describes aspects of wireless system planning.
CO5: Understand of modern and futuristic wireless networks architecture.
CO6: Summarize different issues in performance analysis.

304193: Project Management

CO1: Apply the fundamental knowledge of project management for effectively handling the projects. CO2: Identify and select the appropriate project based on feasibility study and undertake its effective planning.

CO3: Assimilate effectively within the organizational structure of project and handle project management related issues in an efficient manner.

CO4: Apply the project scheduling techniques to create a Project Schedule Plan and accordingly utilize the resources to meet the project deadline.

CO5: Identify and assess the project risks and manage finances in line with Project Financial Management Process.

CO6: Develop new products assessing their commercial viability and develop skillsets for becoming successful entrepreneurs while being fully aware of the legal issues related to Product development and Entrepreneurship.

304194: Power Devices & Circuits

CO1: To differentiate based on the characteristic parameters among SCR, GTO, MOSFET & IGBT and identify suitability of the power device for certain applications and understand the significance of device ratings.

CO2: To design triggering / driver circuits for various power devices.

CO3: To evaluate and analyze various performance parameters of the different converters and its topologies.

CO4: To understand significance and design of various protections circuits for power devices.

CO5: To evaluate the performance of uninterruptible power supplies, switch mode power supplies and battery.

CO6: To understand case studies of power electronics in applications like electric vehicles, solar systems etc.

304195 (A): Digital Image Processing (Elective -II)

CO1: Apply knowledge of mathematics for image understanding and analysis.

CO2: Implement spatial domain image operations.

CO3: Design and realize various algorithms for image segmentation.

CO4: Design and realize various algorithms for image Compression.

CO5: Apply restoration to remove noise in the image.

CO6: Describe the object recognition system.

304195 (C): Advanced JAVA Programming (Elective -II)

CO1: Design and develop GUI applications using Applets.

CO2: Apply relevant AWT/ swing components to handle the given event.

CO3: Design and develop GUI applications using Abstract Windowing Toolkit (AWT), Swing and Event Handling.

CO4: Learn to access database through Java programs, using Java Database Connectivity (JDBC)

CO5: Invoke the remote methodsin an application using Remote Method Invocation (RMI)

CO6: Develop program for client /server communication using Java Networking classes.

304199: Internship

CO1: To develop professional competence through internship.

CO2: To apply academic knowledge in a personal and professional environment.

CO3: To build the professional network and expose students to future employees.
CO4: Apply professional and societal ethics in their day to day life.
CO5: To become a responsible professional having social, economic and administrative considerations.
CO6: To make own career goals and personal aspirations

304200: Mini Project
CO1: Understand, plan and execute a Mini Project with team.
CO2: Implement electronic hardware by learning PCB artwork design, soldering techniques, testing and troubleshooting etc.
CO3: Prepare a technical report based on the Mini project.
CO 4: Deliver technical seminar based on the Mini Project work carried out.

BE Sem I
404181:Radiation & Microwave Theory
CO1: Apply the fundamentals of electromagnetic to derive free space propagation equation and distinguish various performance parameters of antenna.
CO2: Identify various modes in the waveguide. Compare: coaxial line, rectangular waveguides & striplines and identify applications of the same.
CO3: Explore construction and working of principles passive microwave devices/components.
CO4: Explore construction and working of principles active microwave devices/components.
CO5: Analyze the structure, characteristics, operation, equivalent circuits and applications of various microwave solid state active devices.
CO6: Know the various microwave systems, device set ups of microwave measurement devices and Identify the effect of radiations on environmental sustainability.

404182: VLSI Design and Technology
CO1: Develop effective HDL codes for digital design.
CO2: Apply knowledge of real time issues in digital design.
CO3: Model digital circuit with HDL, simulate, synthesis and prototype in PLDs.
CO4: Design CMOS circuits for specified applications.
CO5: Analyze various issues and constraints in design of an ASIC.
CO6: Apply knowledge of testability in design and Build In Self Test (BIST) circuit.

404183: Cloud Computing
CO1: Understand the basic concepts of Cloud Computing.
CO2: Describe the underlying principles of different Cloud Service Models.
CO3: Classify the types of Virtualization.
CO4: Examine the Cloud Architecture and understand the importance of Cloud Security.
CO5: Develop applications on Cloud Platforms.
CO6: Evaluate distributed computing and the Internet of Things.

404184: Elective-3
JAVA Script
CO1: Use basic features of java script.
CO2: Use relevant data types for developing application in java script.
CO3: Use the function and objects as self-contained, with data passing in and out through well-defined interfaces in development of small systems.
CO4: Apply the regular expression for Text matching and manipulation.

CO5: Explore use of the various aspects of JavaScript object models that are fundamental to the proper use of the language.
CO6: Develop the application using windows controlling and form handling.

Embedded & RTOS
CO1: Apply design metrics of Embedded systems to design real time applications to match recent trends in technology.
CO2: Apply Real time systems concepts.
CO3: Evaluate μCOS operating system and its services.
CO4: Apply Embedded Linux Development Environment and testing tools.
CO5: Analyze Linux operating system and device drivers.
CO6: Analyze the hardware – software co design issues for testing of real time Embedded system.

404185: Elective - 4
Deep Learning
CO1: Classify machine learning algorithms and its types
CO2: Discuss the concepts of deep learning and its Frameworks.
CO3: Identify the deep learning architecture with respect to the applications.
CO4: Demonstrate different architectures of Convolutional neural networks.
CO5: Discuss natural language processing architecture.
CO6: Make use of various case studies and Deep learning applications.
Data Mining
CO1: Understand the process of data mining and performance issues in data mining.
CO2: Apply data preprocessing techniques to the historical data collected in data warehouse
CO3: Analyze various types of Frequent pattern analysis methods and advanced Pattern mining techniques
CO4: Evaluate various data mining algorithms for developing effective data mining models
CO5: Analyze different clustering and outlier detection methods
CO6: Design data mining models in different mining application areas

2015 course

SE Sem I

204181: Signals and Systems
CO1: Understand mathematical description and representation of continuous and discrete time signals and systems.
CO2: Develop input output relationship for linear shift invariant system and understand the convolution operator for continuous and discrete time system.
CO3: Understand and resolve the signals in frequency domain using Fourier series and Fourier transforms.
CO4: Understand the limitations of Fourier transform and need for Laplace transform and develop the ability to analyze the system in s- domain.
CO5: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
CO1: Comply and verify parameters after exciting devices by any stated method.
CO2:. Implement circuit and test the performance.
CO3: Analyze small signal model of FET and MOSFET.

CO4: Explain behavior of FET at low frequency.
CO5: Design an adjustable voltage regulator circuits.

204183 :Electrical Circuits and Machines
CO1: Analyze basic AC & DC circuit for voltage, current and power by using KVL, KCL, and network theorems.
CO2: Explain the working principle of different electrical machines.
CO3: Select proper electrical motor for given application.
CO4: Design and analyze transformers.

204184 : Data Structures and Algorithms
CO1: Discuss the computational efficiency of the principal algorithms such as sorting & searching.
CO2: Write and understand the programs that use arrays & pointers in C
CO3: Describe how arrays, records, linked structures are represented in memory and use them in algorithms.
CO4: Implement stacks & queues for various applications.
CO5: Understand various terminologies and traversals of trees and use them for various applications.
CO6: Understand various terminologies and traversals of graphs and use them for various applications

204185 : Digital Electronics
CO1: Use the basic logic gates and various reduction techniques of digital logic circuit in detail.
CO2: Design combinational and sequential circuits.
CO3: Design and implement hardware circuit to test performance and application.
CO4: Understand the architecture and use of microcontrollers for basic operations and Simulate using simulation software.

204186: Electronic Measuring Instruments and Tools
CO1: Understand fundamental of various electrical measurements.
CO2: Understand and describe specifications, features and capabilities of electronic instruments.
CO3: Finalize the specifications of instrument and select an appropriate instrument for given measurement.
CO4: Carry out required measurement using various instruments under different setups.
CO5: Able to compare measuring instruments for performance parameters
CO6:Select appropriate instrument for the measurement of electrical parameter professionally.

204192: Audit course-I
Japanese Language module-I
CO1:will have ability of basic communication.
CO2:will have the knowledge of Japanese script.
CO3: will get introduced to reading , writing and listening skills
CO4:will develop interest to pursue professional Japanese Language course

204192 Audit Course-I
Road Safety Management

CO1:Changes in awareness levels, knowledge and understanding
CO2:A change in attitudes / behavior e.g. against drink-drive;
CO3:Casualty Reduction;
CO4:That remedial education for those who make mistakes and for low level offences where this is more effective than financial penalties and penalty points;
CO5: Improving Road Safety Together

SE Sem II

207005: Engineering Mathematics -III
CO1: Solve higher order linear differential equation using appropriate techniques for modeling and analyzing electrical circuits.
CO2: Solve problems related to Fourier transform, Z-transform and applications to Communication systems and Signal processing.
CO3: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.
CO4: Perform vector differentiation and integration, analyze the vector fields and apply to Electro-Magnetic fields.
CO5: Analyze conformal mappings, transformations and perform contour integration of complex functions in the study of electrostatics and signal processing.

204187: Integrated Circuits
CO1:Understand the characteristics of IC and Op-Amp and identify the internal structure.
CO2: Understand and identify various manufacturing techniques.
CO3: Derive and determine various performances based parameters and their significance for Op-Amp.
CO4: Comply and verify parameters after exciting IC by any stated method.
CO5: Analyze and identify the closed loop stability considerations and I/O limitations.
CO6: Analyze and identify linear and nonlinear applications of Op-Amp.
CO7: Understand and verify results (levels of V & I) with hardware implementation.
CO8: Implement hardwired circuit to test performance and application for what it is being designed.
CO9: Understand and apply the functionalities of PLL to Frequency synthesizer, multiplier, FM, and AM demodulators

204188: Control Systems
CO1: Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.
CO2: Determine the (absolute) stability of a closed-loop control system.
CO3: Perform time domain and frequency domain analysis of control systems required for stability analysis.
CO4: Perform time domain and frequency domain correlation analysis.
CO5: Apply root-locus, Frequency Plots technique to analyze control systems.
CO6: Express and solve system equations in state variable form

204189 :Analog Communications
CO1: Understand and identify the fundamental concepts and various components of analogcommunication systems.
CO2: Explain signal to noise ratio, noise figure and noise temperature for single and cascaded

stages in a communication system.
CO3: Describe analog pulse modulation techniques and digital modulation technique.
CO4:Develop the ability to compare and contrast the strengths and weaknesses of variouscommunication systems

204190 :Object Oriented Programming
CO1: Describe the principles of object oriented programming.
CO2: Apply the concepts of data encapsulation, inheritance in C++.
CO3: Understand basic program constructs in Java
CO4: Apply the concepts of classes, methods and inheritance to write programs Java.
CO5:Use arrays, vectors and strings concepts and interfaces to write programs in Java.
CO6: Describe and use the concepts in Java to develop user friendly program

204191: EMPLOYABILITY SKILL DEVELOPMENT
CO1: Have skills and preparedness for aptitude tests.
CO2: Be equipped with essential communication skills (writing, verbal and non-verbal)
CO3: Master the presentation skill and be ready for facing interviews.
CO4: Build team and lead it for problem solving.

204193:Audit course-II
Japanese Language module II
CO1: will have ability of basic communication.
CO2: will have the knowledge of Japanese script.
CO3:will get introduced to reading , writing and listening skills
CO4:will develop interest to pursue professional Japanese Language course.

T.E Sem I

304181: Digital Communication
CO1: Understand working of waveform coding techniques and analyse their performance.
CO2:Analyze the performance of a baseband and pass band digital communication system in terms of error rate and spectral efficiency.
CO3: Perform the time and frequency domain analysis of the signals in a digital communication system.
CO4: Design of digital communication system.
CO5: Understand working of spread spectrum communication system and analyze its performance.

304182: Digital Signal Processing
CO1:Analyze the discrete time signals and system using different transform domain techniques.
CO2: Design and implement LTI filters for filtering different real world signals.
CO3: Develop different signal processing applications using DSP processor.

304183: Electromagnetics
CO1:Understand the basic mathematical concepts related to electromagnetic vector fields.

CO2: Apply the principles of electrostatics to the solutions of problems relating to electric field and electric potential, boundary conditions and electric energy density.
CO3: Apply the principles of magnetostatics to the solutions of problems relating to magnetic field and magnetic potential, boundary conditions and magnetic energy density.
CO4:Understand the concepts related to Faraday‘s law, induced emf and Maxwell‘s equations.
CO5: Apply Maxwell‘s equations to solutions of problems relating to transmission lines and uniform plane wave propagation.

304184: Microcontrollers
CO1: Learn importance of microcontroller in designing embedded application.
CO2:Learn use of hardware and software tools.
CO3: Develop interfacing to real world devices

304185: Mechatronics
CO1:Identification of key elements of mechatronics system and its representation in terms of block diagram
CO2: Understanding basic principal of Sensors and Transducer.
CO3:Able to prepare case study of the system given

304193: Electronic System Design
CO1: Apply the fundamental concepts and working principles of electronics devices to design
electronics systems.
CO2:Shall be able to interpret datasheets and thus select appropriate components and devices
CO3: Select appropriate transducer and signal conditioning circuit to design prototype of Data
Acquisition system.
CO4: Design an electronic system/sub-system and validate its performance by simulating the same.
CO5:Shall be able to use an EDA tool for circuit schematic and simulation.
CO6:Create, manage the database and query handling using suitable tools.

Audit Course 3
Japanese Language Audit Course
CO1:One will have the knowledge of Japanese script.
CO:2One will get introduced to reading , writing and listening skills.
CO3:One will develop interest to pursue professional Japanese Language course

TE Sem II
304186: Power Electronics
CO1:Design & implement a triggering / gate drive circuit for a power device
CO2:Understand, perform & analyze different controlled converters.
CO3:Evaluate battery backup time & design a battery charger.
CO4:Design & implement over voltage / over current protection circuit.

304187: Information Theory Coding Techniques and Communication Networks
CO1:Perform information theoretic analysis of communication system.
CO2: Design a data compression scheme using suitable source coding technique.
CO3: Design a channel coding scheme for a communication system.
CO4: Understand and apply fundamental principles of data communication and networking.
CO5:Apply flow and error control techniques in communication networks.

304188: Business Management
CO1: Get overview of Management Science aspects useful in business.
CO2:Get motivation for Entrepreneurship
CO3:Get Quality Aspects for Systematically Running the Business
CO4:To Develop Project Management aspect and Entrepreneurship Skills.

304189: Advanced Processors
CO1 : Describe the ARM microprocessor architectures and its feature.
CO2:Interface the advanced peripherals to ARM based microcontroller
CO3: Design embedded system with available resources.
CO4: Use of DSP Processors and resources for signal processing applications.

304190 :System Programming and Operating System
CO1:Demonstrate the knowledge of Systems Programming and Operating Systems
CO2:Formulate the Problem and develop the solution for same.
CO3:Compare and analyse the different implementation approach of system programming operating system abstractions.
CO4:Interpret various OS functions used in Linux / Ubuntu

304196: Employability Skills and Mini Project
CO1:Understand, plan and execute a Mini Project with team.
CO2:Implement electronic hardware by learning PCB artwork design, soldering techniques, testing and troubleshooting etc.
CO3: Prepare a technical report based on the Mini project.
CO4: Deliver technical seminar based on the Mini Project work carried out.

Audit Course 4
CO1: One will have ability of basic communication.
CO1: One will have the knowledge of Japanese script.
CO1: One will get introduced to reading , writing and listening skills Faculty of Engineering Savitribai Phule Pune University
CO1: One will develop interest to pursue professional Japanese Language course.

BE Sem I

404181:VLSI Design& Technology

CO1:Write effective HDL coding for digital design.
CO2: Apply knowledge of real time issues in digital design.
CO3: Model digital circuit with HDL, simulate, synthesis and prototype in PLDs.
CO4: Design CMOS circuits for specified applications.
CO5: Analyze various issues and constraints in design of an ASIC
CO6: Apply knowledge of testability in design and build self test circuit.

404182:Computer Networks & Security
CO1: Understand fundamental underlying principles of computer networking
CO2: Describe and analyze the hardware, software, components of a network and their interrelations.
CO3: Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies
CO4: Have a basic knowledge of installing and configuring networking applications.
CO5:Specify and identify deficiencies in existing protocols, and then go onto select new and better protocols.
CO6: Have a basic knowledge of the use of cryptography and network security.

404183: Radiation and Microwave Techniques
CO1: Differentiate various performance parameters of radiating elements.
CO2: Analyze various radiating elements and arrays.
CO3: Apply the knowledge of waveguide fundamentals in design of transmission lines.
CO4: Design and set up a system consisting of various passive microwave components.
CO5: Analyze tube based and solid state active devices along with their applications.
CO6: Measure various performance parameters of microwave components.

404184 Digital Image and Video Processing (Elective-I)
CO1: Develop and implement basic mathematical operations on digital images.
CO2: Analyze and solve image enhancement and image restoration problems.
CO3: Identify and design image processing techniques for object segmentation and recognition.
CO4: Represent objects and region of the image with appropriate method.
CO5: Apply 2-D data compression techniques for digital images.
CO6: Explore video signal representation and different algorithm for video processing.

404184 Embedded Systems and RTOS(Elective-I)
CO1:Understand design of embedded system
CO2:Use RTOS in embedded application
CO3:Use modern architecture for embedded system
CO4: Use Linux for embedded system development
CO5:Use open platform for embedded system development

404184: Internet of Things (Elective-I)
CO1:On completion of the course, student will be able to
CO2: Understand the various concepts, terminologies and architecture of IoT systems.

CO3:Use sensors and actuators for design of IoT.
CO4:Understand and apply various protocols for design of IoT systems
CO5: Use various techniques of data storage and analytics in IoT
CO6:Understand various applications of IoT

404185 :Electronic Product Design (Elective-II)
CO1:Understand various stages of hardware, software and PCBdesign.
CO2: Importance of product test &testspecifications.
CO3:Special design considerations and importance ofdocumentation.

404185: Artificial Intelligence (Elective II)
CO1:Design and implement key components of intelligent agents and expert systems.
CO2: To apply knowledge representation techniques and problem solving strategies to common
AI applications.
CO3:Applyand integrate various artificial intelligence techniques in intelligent system development as well as understand the importance of maintaining intelligent systems.
CO4:Build rule-based and other knowledge-intensive problem solvers.

404185: Electronics in Agriculture (Elective II)
CO1:Understand Role of computers & virtual instrumentation.
CO2:Provide communication solution for interpreting environmental parameters with Electronics systems.
CO3:Describe Instrument technology used in agriculture.
CO4:Apply knowledge of Electronics in Agriculture.
CO5:Understand Greenhouse Technology & Role of Electronics Governance.

BE Sem II

404189 :Mobile Communication
CO1: The student should be able to apply the concepts of telecommunication switching, traffic and networks.
CO2: The student should be able to analyze the telecommunication traffic.
CO3: The student should be able to analyze radio channel and cellular capacity.
CO4: The student should be able to explain and apply concepts of GSM and CDMA system.

404190: Broadband Communication Systems
CO:To Identify the basic elements of fiber optics communication link,sources ,detectors, fiber modes & configuration.
CO2: To identify various losses along the optical link ,identify distortion & degradation of signals and To design Analog Link and Digital link budget to achieve SNR and BER of an optical communication system.
CO3 :To learn fundamentals of Satellite Communication system, fundamentals of orbital mechanics
CO4 :To Carry out Satellite Link design for Up Link and Down Link

404191 :Machine Learning (Elective III)

CO1: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.
CO2:To mathematically analyze various machine learning approaches and paradigms.
CO3:To implement convolution neural networks in recognition applications.

404191:Audio and Speech Processing (Elective III)

CO1:Design and implement algorithms for processing speech and audio signals considering the properties of acoustic signals and human hearing.
CO2: Analyze speech signal to extract the characteristic of vocal tract (formants) and vocal cords (pitch).
CO3: Analyze speech signal for extracting LPC and MFCC Parameters of speech signal.
CO4: 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.

404191: Software Defined Radio (Elective III)

CO1:Compare SDR with traditional Hardware Radio HDR.
CO2:Implement modern wireless system based on OFDM, MIMO & Smart Antenna.
CO3:Build experiment with real wireless waveform and applications, accessing both PHY and
MAC, Compare SDR versus MATLAB and Hardware Radio
CO4: Work on open projects and explore their capability to build their own communication System.

404192: ROBOTICS (Elective-IV)

CO1: Familiar with the history, concept development and key components of robotics technologies.
CO2: Implement basic mathematics manipulations of spatial coordinate representation and transformation.
CO3:Solve basic robot forward and inverse kinematic problems
CO4:Understand and able to solve basic robotic dynamics, path planning and control problems

404194 :Renewable Energy Systems (Elective-IV)

CO1:Interpret energy reserves of India and potential of different energy sources.
CO2:Measure the solar radiation parameters and performance of different solar collectors.
CO3:Calculate different parameters of wind turbine rotor.
CO4:Implicit the importance and applications of geothermal and ocean energy.
CO5:Demonstrate knowledge in field of fuel cell and potential for power generation.

404193: Lab Practice -III (MC+BCS)

CO1: Students should be able to set up and perform experiment on telecommunication switching and mobile communication and optical communication system.
CO2: As a part of their term work, students should visit the MTSO office and hence should be able to understand and observe actual switching systems and mobile communication technology.

CO3: Students should be able to design and set up Analog Link and Digital link of an optical communication system.
CO4: Students should be able to Establish a direct communication link between Uplink Transmitter and Downlink Receiver using tone signal, To establish an AUDIO-VIDEO satellite link between Transmitter and Receiver, to find out the link failure.

404195: Project Stage II
CO1. Identify, formulate and design the solution for engineering problem by investigating the literature.
CO2. apply appropriate modern tools, technologies or multidisciplinary approach to produce engineering solutions which will be beneficial to society and environment.
CO3. Demonstrate the project and communicate effectively in team, apply ethical ergonomic, and safety constraints in the project work.
CO4. Demonstrate knowledge and understanding of engineering and management principles and use it for life-long learning.

Audit Course 6 (2): Environmental Issues And Disaster Management
CO1:To learn the different environmental issues and disasters.
CO2:To deal with problems associated with environment and effectively handle the disasters.

Modern Education Society's College of Engineering, Pune
Department of E&TC
COURSE OUTCOMES

2019 Course

SE Sem I

207005: Engineering Mathematics – III

CO1: Solve higher order linear differential equation using appropriate techniques for modelling, analyzing of electrical circuits and control systems.
CO2: Apply concept of Fourier transform & Z-transform and its applications to continuous & discrete systems, signal & image processing and communication systems.
CO3: 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.
CO4: Perform vector differentiation & integration, analyze the vector fields and apply to electro-magnetic fields & wave theory.
CO5: Analyze Complex functions, Conformal mappings, Contour integration applicable to electrostatics, digital filters, signal and image processing.

204181: Electronic Circuits

CO1: Assimilate the physics, characteristics and parameters of MOSFET towards its application as amplifier.
CO2: Design MOSFET amplifiers, with and without feedback, & MOSFET oscillators, for given specifications.
CO3: Analyze and assess the performance of linear and switching regulators, with their variants, towards applications in regulated power supplies.
CO4: Explain internal schematic of Op-Amp and define its performance parameters.
CO5: Design, Build and test Op-amp based analog signal processing and conditioning circuits towards various real time applications.
CO6: Understand and compare the principles of various data conversion techniques and PLL with their applications.

204182: Digital Circuits

CO1: Identify and prevent various hazards and timing problems in a digital design.
CO2: Use the basic logic gates and various reduction techniques of digital logic circuit.
CO3: Analyze, design and implement combinational logic circuits.
CO4: Analyze, design and implement sequential circuits.
CO5: Differentiate between Mealy and Moore machines.
CO6: Analyze digital system design using PLD.

204183: Electrical Circuits

CO1: Analyze the simple DC and AC circuit with circuit simplification techniques.
CO2: Formulate and analyze driven and source free RL and RC circuits.
CO3: Formulate & determine network parameters for given network and analyze the given network using Laplace Transform to find the network transfer function.
CO4: Explain construction, working and applications of DC Machines / Single Phase & Three Phase AC Motors.

CO5: Explain construction, working and applications of special purpose motors & understand motors used in electrical vehicles.
CO6: Analyze and select a suitable motor for different applications.

204184: Data Structures
CO1: Solve mathematical problems using C programming language.
CO2: Implement sorting and searching algorithms and calculate their complexity.
CO3: Develop applications of stack and queue using array.
CO4: Demonstrate applicability of Linked List.
CO5: Demonstrate applicability of nonlinear data structures - Binary Tree with respect to its time complexity.
CO6: Apply the knowledge of graph for solving the problems of spanning tree and shortest path algorithm

SE Sem II
204191: Signals & Systems
CO1: Identify, classify basic signals and perform operations on signals.
CO2: Identify, Classify the systems based on their properties in terms of input output relation and in terms of impulse response and will be able to determine the convolution between to signals.
CO3: Analyze and resolve the signals in frequency domain using Fourier series and Fourier Transform.
CO4: Resolve the signals in complex frequency domain using Laplace Transform, and will be able to apply and analyze the LTI systems using Laplace Transforms.
CO5: Define and Describe the probability, random variables and random signals. Compute the probability of a given event, model, compute the CDF and PDF.
CO6: Compute the mean, mean square, variance and standard deviation for given random variables using PDF.

204192: Control Systems
CO1: Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.
CO2: Determine the (absolute) stability of a closed-loop control system.
CO3: Perform time domain analysis of control systems required for stability analysis.
CO4: Perform frequency domain analysis of control systems required for stability analysis.
CO5: Apply root-locus, Frequency Plots technique to analyze control systems.
CO6: Express and solve system equations in state variable form.
CO7: Differentiate between various digital controllers and understand the role of the controllers in Industrial automation.

204193: Principles of Communication Systems
CO1: To compute & compare the bandwidth and transmission power requirements by analyzing time and frequency domain spectra of signal required for modulation schemes under study.
CO2: Describe and analyze the techniques of generation, transmission and reception of Amplitude Modulation Systems.
CO3: Explain generation and detection of FM systems and compare with AM systems.
CO4: Exhibit the importance of Sampling Theorem and correlate with Pulse Modulation technique (PAM, PWM, and PPM).

CO5: Characterize the quantization process and elaborate digital representation techniques (PCM, DPCM, DM and ADM).
CO6: Illustrate waveform coding, multiplexing and synchronization techniques and articulate their importance in baseband digital transmission.

204194: Object Oriented Programming
CO1: Describe the principles of object oriented programming.
CO2: Apply the concepts of data encapsulation, inheritance in C++.
CO3: Understand Operator overloading and friend functions in C++.
CO4: Apply the concepts of classes, methods inheritance and polymorphism to write programs C++. CO5: Apply Templates, Namespaces and Exception Handling concepts to write programs in C++. CO6: Describe and use of File handling in C++.

204199: Employbility Skills Development
CO1: Define personal and career goals using introspective skills and SWOC assessment. Outline and evaluate short-term and long-term goals.
CO2: Develop effective communication skills (listening, reading, writing, and speaking), self- management attributes, problem solving abilities and team working & building capabilities in order to fetch employment opportunities and further succeed in the workplace.
CO3: Be a part of a multi-cultural professional environment and work effectively by enhancing inter-personal relationships, conflict management and leadership skills.
CO4: Comprehend the importance of professional ethics, etiquettes & morals and demonstrate sensitivity towards it throughout certified career.
CO5: Develop practically deployable skill set involving critical thinking, effective presentations and leadership qualities to hone the opportunities of employability and excel in the professional environment.

204200: Project Based Learning
CO1: Identify the real-world problem (possibly of interdisciplinary nature) through a rigorous literature survey and formulate / set relevant aim and objectives.
CO2: Contribute to society through proposed solution by strictly following professional ethics and safety measures.
CO3: Propose a suitable solution based on the fundamentals of electronics and communication engineering by possibly the integration of previously acquired knowledge.
CO4: Analyze the results and arrive at valid conclusion.
CO5: Use of technology in proposed work and demonstrate learning in oral and written form.
CO6: Develop ability to work as an individual and as a team member.

204198: Data Analytics Lab
CO1: Install Python Jupyter and write programs using NumPy, Pandas, Matplotlib and Scikit-learn.
CO2. Write programs related to 1D and 2D arrays
CO3. Write programs using data seriesproject related to data analytics
CO4. Write programs using data frames
CO5. Write programs to visualize output using various graphs and plots
CO6. Complete an end to end project related to data analytics

TE Sem I
304181: Digital Communication
CO1: Apply the statistical theory for describing various signals in a communication system.

CO2: Understand and explain various digital modulation techniques used in digital communication systems and analyze their performance in presence of AWGN noise.
CO3: Describe and analyze the digital communication system with spread spectrum modulation.
CO4: Analyze a communication system using information theoretic approach.
CO5: Use error control coding techniques to improve performance of a digital communication system.

304182: Electromagnetic Field Theory
CO1: Apply the basic electromagnetic principles and determine the fields (E & H) due to the given source.
CO2: Apply boundary conditions to the boundaries between various media to interpret behavior of the fields on either sides.
CO3: State, Identify and Apply Maxwell's equations (integral and differential forms) in both the forms (Static, time-varying or Time-harmonic field) for various sources, Calculate the time average power density using Poynting Theorem, Retarded magnetic vector potential.
CO4: Formulate, Interpret and solve simple uniform plane wave (Helmholtz Equations) equations, and analyze the incident/reflected/transmitted waves at normal incidence.
CO5: Interpret and Apply the transmission line equation to transmission line problems with load impedance to determine input and output voltage/current at any point on the Transmission line, Find input/load impedance, input/load admittance, reflection coefficient, SWR, Vmax/Vmin, length of transmission line using Smith Chart.
CO6: Carry out a detailed study, interpret the relevance and applications of Electromagnetics

304183: Database Management
CO1: Ability to implement the underlying concepts of a database system.
CO2: Design and implement a database schema for a given problem-domain using data model.
CO3: Formulate, using SQL/DML/DDL commands, solutions to a wide range of query and update problems.
CO4: Implement transactions, concurrency control, and be able to do Database recovery.
CO5: Able to understand various Parallel Database Architectures and its applications.
CO6: Able to understand various Distributed Databases and its applications.

304184: Microcontroller
CO1: Understand the fundamentals of microcontroller and programming.
CO2: Interface various electronic components with microcontrollers.
CO3: Analyze the features of PIC 18F XXXX.
CO4: Describe the programming details in peripheral support.
CO5: Develop interfacing models according to applications.
CO6: Evaluate the serial communication details and interfaces.

304185 (A): Digital Signal Processing (Elective -I)
CO1: Interpret and process discrete/ digital signals and represent DSP system.
CO2: Analyze the digital systems using the Z-transform techniques.
CO3: Implement efficient transform and its application to analyze DT signals.
CO4: Design and implement IIR filters.
CO5: Design and implement FIR filters.
CO6: Apply DSP techniques for speech/ biomedical/ image signal processing.

304185 (C): Fundamentals of JAVA Programming (Elective -I)
CO1: Understand the basic principles of Java programming language
CO2: Apply the concepts of classes and objects to write programsin Java
CO3: Demonstrate the concepts of methods & Inheritance
CO4: Use the concepts of interfaces & packages for program implementation
CO5: Understand multithreading and Exception handling in Java to develop robust programs
CO6: Use Graphics class, AWT packages and manage input and output files in Java

304185 (D): Computer Networks(Elective -I)
CO1: Design LAN using appropriate networking architecture, topologies, transmission media, and networking devices.
CO2: Understand the working of controlling techniques for flawless data communication using data link layer protocols.
CO3: Learn the functions of network layer, various switching techniques and internet protocol addressing.
CO4: Explore various interior and exterior, unicasting and multicasting protocols.
CO5: Analyze data flow using TCP/UDP Protocols, congestion control techniques for QoS.
CO6: Illustrate the use of protocols at application layer.

304190: Skill Development
CO1: Student should recognize the need to engage in independent and life-long learning in required skill sets
CO2: Student needs to experience the impact of industries on society by visiting different industries and understand the importance of industrial products for analog and digital circuits and systems.
CO3: Student has to make use of the modern electronic and IT Engineering Tools and Technologies for solving electronic engineering problems.
CO4: Student would be able to communicate effectively at different technical and administrative levels.
CO5: Student will exhibit leadership skills both as an individual and as a member in a team in multidisciplinary environment.

304191A: Mandatory Audit Course 5
CO1:To know about various aspects of soft skills and learn ways to develop personality Leadership, team building,decision making and stress management
CO2:Find out engineering solutions to meet the environmental standards set by legislation.
CO3:Understand how the urbanization proceeds in the right path causing minimum impact on environment.
CO4:how to manage water resources, design conservation strategies, and develop energy and transportation policies that improve society and the environment.

TE Sem II
304192: Cellular Networks
CO1: Understand fundamentals of wireless communications.
CO2: Discuss and study OFDM and MIMO concepts.
CO3: Elaborate fundamentals mobile communication.
CO4: Describes aspects of wireless system planning.
CO5: Understand of modern and futuristic wireless networks architecture.
CO6: Summarize different issues in performance analysis.

304193: Project Management

CO1: Apply the fundamental knowledge of project management for effectively handling the projects. CO2: Identify and select the appropriate project based on feasibility study and undertake its effective planning.

CO3: Assimilate effectively within the organizational structure of project and handle project management related issues in an efficient manner.

CO4: Apply the project scheduling techniques to create a Project Schedule Plan and accordingly utilize the resources to meet the project deadline.

CO5: Identify and assess the project risks and manage finances in line with Project Financial Management Process.

CO6: Develop new products assessing their commercial viability and develop skillsets for becoming successful entrepreneurs while being fully aware of the legal issues related to Product development and Entrepreneurship.

304194: Power Devices & Circuits

CO1: To differentiate based on the characteristic parameters among SCR, GTO, MOSFET & IGBT and identify suitability of the power device for certain applications and understand the significance of device ratings.

CO2: To design triggering / driver circuits for various power devices.

CO3: To evaluate and analyze various performance parameters of the different converters and its topologies.

CO4: To understand significance and design of various protections circuits for power devices.

CO5: To evaluate the performance of uninterruptible power supplies, switch mode power supplies and battery.

CO6: To understand case studies of power electronics in applications like electric vehicles, solar systems etc.

304195 (A): Digital Image Processing (Elective -II)

CO1: Apply knowledge of mathematics for image understanding and analysis.

CO2: Implement spatial domain image operations.

CO3: Design and realize various algorithms for image segmentation.

CO4: Design and realize various algorithms for image Compression.

CO5: Apply restoration to remove noise in the image.

CO6: Describe the object recognition system.

304195 (C): Advanced JAVA Programming (Elective -II)

CO1: Design and develop GUI applications using Applets.

CO2: Apply relevant AWT/ swing components to handle the given event.

CO3: Design and develop GUI applications using Abstract Windowing Toolkit (AWT), Swing and Event Handling.

CO4: Learn to access database through Java programs, using Java Database Connectivity (JDBC)

CO5: Invoke the remote methodsin an application using Remote Method Invocation (RMI)

CO6: Develop program for client /server communication using Java Networking classes.

304199: Internship

CO1: To develop professional competence through internship.

CO2: To apply academic knowledge in a personal and professional environment.

CO3: To build the professional network and expose students to future employees.
CO4: Apply professional and societal ethics in their day to day life.
CO5: To become a responsible professional having social, economic and administrative considerations.
CO6: To make own career goals and personal aspirations

304200: Mini Project
CO1: Understand, plan and execute a Mini Project with team.
CO2: Implement electronic hardware by learning PCB artwork design, soldering techniques, testing and troubleshooting etc.
CO3: Prepare a technical report based on the Mini project.
CO 4: Deliver technical seminar based on the Mini Project work carried out.

BE Sem I
404181:Radiation & Microwave Theory
CO1: Apply the fundamentals of electromagnetic to derive free space propagation equation and distinguish various performance parameters of antenna.
CO2: Identify various modes in the waveguide. Compare: coaxial line, rectangular waveguides & striplines and identify applications of the same.
CO3: Explore construction and working of principles passive microwave devices/components.
CO4: Explore construction and working of principles active microwave devices/components.
CO5: Analyze the structure, characteristics, operation, equivalent circuits and applications of various microwave solid state active devices.
CO6: Know the various microwave systems, device set ups of microwave measurement devices and Identify the effect of radiations on environmental sustainability.

404182: VLSI Design and Technology
CO1: Develop effective HDL codes for digital design.
CO2: Apply knowledge of real time issues in digital design.
CO3: Model digital circuit with HDL, simulate, synthesis and prototype in PLDs.
CO4: Design CMOS circuits for specified applications.
CO5: Analyze various issues and constraints in design of an ASIC.
CO6: Apply knowledge of testability in design and Build In Self Test (BIST) circuit.

404183: Cloud Computing
CO1: Understand the basic concepts of Cloud Computing.
CO2: Describe the underlying principles of different Cloud Service Models.
CO3: Classify the types of Virtualization.
CO4: Examine the Cloud Architecture and understand the importance of Cloud Security.
CO5: Develop applications on Cloud Platforms.
CO6: Evaluate distributed computing and the Internet of Things.

404184: Elective-3
JAVA Script
CO1: Use basic features of java script.
CO2: Use relevant data types for developing application in java script.
CO3: Use the function and objects as self-contained, with data passing in and out through well-defined interfaces in development of small systems.
CO4: Apply the regular expression for Text matching and manipulation.

CO5: Explore use of the various aspects of JavaScript object models that are fundamental to the proper use of the language.
CO6: Develop the application using windows controlling and form handling.

Embedded & RTOS
CO1: Apply design metrics of Embedded systems to design real time applications to match recent trends in technology.
CO2: Apply Real time systems concepts.
CO3: Evaluate μCOS operating system and its services.
CO4: Apply Embedded Linux Development Environment and testing tools.
CO5: Analyze Linux operating system and device drivers.
CO6: Analyze the hardware – software co design issues for testing of real time Embedded system.

404185: Elective - 4
Deep Learning
CO1: Classify machine learning algorithms and its types
CO2: Discuss the concepts of deep learning and its Frameworks.
CO3: Identify the deep learning architecture with respect to the applications.
CO4: Demonstrate different architectures of Convolutional neural networks.
CO5: Discuss natural language processing architecture.
CO6: Make use of various case studies and Deep learning applications.
Data Mining
CO1: Understand the process of data mining and performance issues in data mining.
CO2: Apply data preprocessing techniques to the historical data collected in data warehouse
CO3: Analyze various types of Frequent pattern analysis methods and advanced Pattern mining techniques
CO4: Evaluate various data mining algorithms for developing effective data mining models
CO5: Analyze different clustering and outlier detection methods
CO6: Design data mining models in different mining application areas

2015 course

SE Sem I

204181: Signals and Systems
CO1: Understand mathematical description and representation of continuous and discrete time signals and systems.
CO2: Develop input output relationship for linear shift invariant system and understand the convolution operator for continuous and discrete time system.
CO3: Understand and resolve the signals in frequency domain using Fourier series and Fourier transforms.
CO4: Understand the limitations of Fourier transform and need for Laplace transform and develop the ability to analyze the system in s- domain.
CO5: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
CO1: Comply and verify parameters after exciting devices by any stated method.
CO2:. Implement circuit and test the performance.
CO3: Analyze small signal model of FET and MOSFET.

CO4: Explain behavior of FET at low frequency.
CO5: Design an adjustable voltage regulator circuits.

204183 :Electrical Circuits and Machines
CO1: Analyze basic AC & DC circuit for voltage, current and power by using KVL, KCL, and network theorems.
CO2: Explain the working principle of different electrical machines.
CO3: Select proper electrical motor for given application.
CO4: Design and analyze transformers.

204184 : Data Structures and Algorithms
CO1: Discuss the computational efficiency of the principal algorithms such as sorting & searching.
CO2: Write and understand the programs that use arrays & pointers in C
CO3: Describe how arrays, records, linked structures are represented in memory and use them in algorithms.
CO4: Implement stacks & queues for various applications.
CO5: Understand various terminologies and traversals of trees and use them for various applications.
CO6: Understand various terminologies and traversals of graphs and use them for various applications

204185 : Digital Electronics
CO1: Use the basic logic gates and various reduction techniques of digital logic circuit in detail.
CO2: Design combinational and sequential circuits.
CO3: Design and implement hardware circuit to test performance and application.
CO4: Understand the architecture and use of microcontrollers for basic operations and Simulate using simulation software.

204186: Electronic Measuring Instruments and Tools
CO1: Understand fundamental of various electrical measurements.
CO2: Understand and describe specifications, features and capabilities of electronic instruments.
CO3: Finalize the specifications of instrument and select an appropriate instrument for given measurement.
CO4: Carry out required measurement using various instruments under different setups.
CO5: Able to compare measuring instruments for performance parameters
CO6:Select appropriate instrument for the measurement of electrical parameter professionally.

204192: Audit course-I
Japanese Language module-I
CO1:will have ability of basic communication.
CO2:will have the knowledge of Japanese script.
CO3: will get introduced to reading , writing and listening skills
CO4:will develop interest to pursue professional Japanese Language course

204192 Audit Course-I
Road Safety Management

CO1:Changes in awareness levels, knowledge and understanding
CO2:A change in attitudes / behavior e.g. against drink-drive;
CO3:Casualty Reduction;
CO4:That remedial education for those who make mistakes and for low level offences where this is more effective than financial penalties and penalty points;
CO5: Improving Road Safety Together

SE Sem II

207005: Engineering Mathematics -III
CO1: Solve higher order linear differential equation using appropriate techniques for modeling and analyzing electrical circuits.
CO2: Solve problems related to Fourier transform, Z-transform and applications to Communication systems and Signal processing.
CO3: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.
CO4: Perform vector differentiation and integration, analyze the vector fields and apply to Electro-Magnetic fields.
CO5: Analyze conformal mappings, transformations and perform contour integration of complex functions in the study of electrostatics and signal processing.

204187: Integrated Circuits
CO1:Understand the characteristics of IC and Op-Amp and identify the internal structure.
CO2: Understand and identify various manufacturing techniques.
CO3: Derive and determine various performances based parameters and their significance for Op-Amp.
CO4: Comply and verify parameters after exciting IC by any stated method.
CO5: Analyze and identify the closed loop stability considerations and I/O limitations.
CO6: Analyze and identify linear and nonlinear applications of Op-Amp.
CO7: Understand and verify results (levels of V & I) with hardware implementation.
CO8: Implement hardwired circuit to test performance and application for what it is being designed.
CO9: Understand and apply the functionalities of PLL to Frequency synthesizer, multiplier, FM, and AM demodulators

204188: Control Systems
CO1: Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.
CO2: Determine the (absolute) stability of a closed-loop control system.
CO3: Perform time domain and frequency domain analysis of control systems required for stability analysis.
CO4: Perform time domain and frequency domain correlation analysis.
CO5: Apply root-locus, Frequency Plots technique to analyze control systems.
CO6: Express and solve system equations in state variable form

204189 :Analog Communications
CO1: Understand and identify the fundamental concepts and various components of analogcommunication systems.
CO2: Explain signal to noise ratio, noise figure and noise temperature for single and cascaded

stages in a communication system.
CO3: Describe analog pulse modulation techniques and digital modulation technique.
CO4:Develop the ability to compare and contrast the strengths and weaknesses of variouscommunication systems

204190 :Object Oriented Programming
CO1: Describe the principles of object oriented programming.
CO2: Apply the concepts of data encapsulation, inheritance in C++.
CO3: Understand basic program constructs in Java
CO4: Apply the concepts of classes, methods and inheritance to write programs Java.
CO5:Use arrays, vectors and strings concepts and interfaces to write programs in Java.
CO6: Describe and use the concepts in Java to develop user friendly program

204191: EMPLOYABILITY SKILL DEVELOPMENT
CO1: Have skills and preparedness for aptitude tests.
CO2: Be equipped with essential communication skills (writing, verbal and non-verbal)
CO3: Master the presentation skill and be ready for facing interviews.
CO4: Build team and lead it for problem solving.

204193:Audit course-II
Japanese Language module II
CO1: will have ability of basic communication.
CO2: will have the knowledge of Japanese script.
CO3:will get introduced to reading , writing and listening skills
CO4:will develop interest to pursue professional Japanese Language course.

T.E Sem I

304181: Digital Communication
CO1: Understand working of waveform coding techniques and analyse their performance.
CO2:Analyze the performance of a baseband and pass band digital communication system in terms of error rate and spectral efficiency.
CO3: Perform the time and frequency domain analysis of the signals in a digital communication system.
CO4: Design of digital communication system.
CO5: Understand working of spread spectrum communication system and analyze its performance.

304182: Digital Signal Processing
CO1:Analyze the discrete time signals and system using different transform domain techniques.
CO2: Design and implement LTI filters for filtering different real world signals.
CO3: Develop different signal processing applications using DSP processor.

304183: Electromagnetics
CO1:Understand the basic mathematical concepts related to electromagnetic vector fields.

CO2: Apply the principles of electrostatics to the solutions of problems relating to electric field and electric potential, boundary conditions and electric energy density.
CO3: Apply the principles of magnetostatics to the solutions of problems relating to magnetic field and magnetic potential, boundary conditions and magnetic energy density.
CO4:Understand the concepts related to Faraday‘s law, induced emf and Maxwell‘s equations.
CO5: Apply Maxwell‘s equations to solutions of problems relating to transmission lines and uniform plane wave propagation.

304184: Microcontrollers
CO1: Learn importance of microcontroller in designing embedded application.
CO2:Learn use of hardware and software tools.
CO3: Develop interfacing to real world devices

304185: Mechatronics
CO1:Identification of key elements of mechatronics system and its representation in terms of block diagram
CO2: Understanding basic principal of Sensors and Transducer.
CO3:Able to prepare case study of the system given

304193: Electronic System Design
CO1: Apply the fundamental concepts and working principles of electronics devices to design
electronics systems.
CO2:Shall be able to interpret datasheets and thus select appropriate components and devices
CO3: Select appropriate transducer and signal conditioning circuit to design prototype of Data
Acquisition system.
CO4: Design an electronic system/sub-system and validate its performance by simulating the same.
CO5:Shall be able to use an EDA tool for circuit schematic and simulation.
CO6:Create, manage the database and query handling using suitable tools.

Audit Course 3
Japanese Language Audit Course
CO1:One will have the knowledge of Japanese script.
CO:2One will get introduced to reading , writing and listening skills.
CO3:One will develop interest to pursue professional Japanese Language course

TE Sem II
304186: Power Electronics
CO1:Design & implement a triggering / gate drive circuit for a power device
CO2:Understand, perform & analyze different controlled converters.
CO3:Evaluate battery backup time & design a battery charger.
CO4:Design & implement over voltage / over current protection circuit.

304187: Information Theory Coding Techniques and Communication Networks
CO1:Perform information theoretic analysis of communication system.
CO2: Design a data compression scheme using suitable source coding technique.
CO3: Design a channel coding scheme for a communication system.
CO4: Understand and apply fundamental principles of data communication and networking.
CO5:Apply flow and error control techniques in communication networks.

304188: Business Management
CO1: Get overview of Management Science aspects useful in business.
CO2:Get motivation for Entrepreneurship
CO3:Get Quality Aspects for Systematically Running the Business
CO4:To Develop Project Management aspect and Entrepreneurship Skills.

304189: Advanced Processors
CO1 : Describe the ARM microprocessor architectures and its feature.
CO2:Interface the advanced peripherals to ARM based microcontroller
CO3: Design embedded system with available resources.
CO4: Use of DSP Processors and resources for signal processing applications.

304190 :System Programming and Operating System
CO1:Demonstrate the knowledge of Systems Programming and Operating Systems
CO2:Formulate the Problem and develop the solution for same.
CO3:Compare and analyse the different implementation approach of system programming operating system abstractions.
CO4:Interpret various OS functions used in Linux / Ubuntu

304196: Employability Skills and Mini Project
CO1:Understand, plan and execute a Mini Project with team.
CO2:Implement electronic hardware by learning PCB artwork design, soldering techniques, testing and troubleshooting etc.
CO3: Prepare a technical report based on the Mini project.
CO4: Deliver technical seminar based on the Mini Project work carried out.

Audit Course 4
CO1: One will have ability of basic communication.
CO1: One will have the knowledge of Japanese script.
CO1: One will get introduced to reading , writing and listening skills Faculty of Engineering Savitribai Phule Pune University
CO1: One will develop interest to pursue professional Japanese Language course.

BE Sem I

404181:VLSI Design& Technology

CO1:Write effective HDL coding for digital design.
CO2: Apply knowledge of real time issues in digital design.
CO3: Model digital circuit with HDL, simulate, synthesis and prototype in PLDs.
CO4: Design CMOS circuits for specified applications.
CO5: Analyze various issues and constraints in design of an ASIC
CO6: Apply knowledge of testability in design and build self test circuit.

404182:Computer Networks & Security
CO1: Understand fundamental underlying principles of computer networking
CO2: Describe and analyze the hardware, software, components of a network and their interrelations.
CO3: Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies
CO4: Have a basic knowledge of installing and configuring networking applications.
CO5:Specify and identify deficiencies in existing protocols, and then go onto select new and better protocols.
CO6: Have a basic knowledge of the use of cryptography and network security.

404183: Radiation and Microwave Techniques
CO1: Differentiate various performance parameters of radiating elements.
CO2: Analyze various radiating elements and arrays.
CO3: Apply the knowledge of waveguide fundamentals in design of transmission lines.
CO4: Design and set up a system consisting of various passive microwave components.
CO5: Analyze tube based and solid state active devices along with their applications.
CO6: Measure various performance parameters of microwave components.

404184 Digital Image and Video Processing (Elective-I)
CO1: Develop and implement basic mathematical operations on digital images.
CO2: Analyze and solve image enhancement and image restoration problems.
CO3: Identify and design image processing techniques for object segmentation and recognition.
CO4: Represent objects and region of the image with appropriate method.
CO5: Apply 2-D data compression techniques for digital images.
CO6: Explore video signal representation and different algorithm for video processing.

404184 Embedded Systems and RTOS(Elective-I)
CO1:Understand design of embedded system
CO2:Use RTOS in embedded application
CO3:Use modern architecture for embedded system
CO4: Use Linux for embedded system development
CO5:Use open platform for embedded system development

404184: Internet of Things (Elective-I)
CO1:On completion of the course, student will be able to
CO2: Understand the various concepts, terminologies and architecture of IoT systems.

CO3:Use sensors and actuators for design of IoT.
CO4:Understand and apply various protocols for design of IoT systems
CO5: Use various techniques of data storage and analytics in IoT
CO6:Understand various applications of IoT

404185 :Electronic Product Design (Elective-II)
CO1:Understand various stages of hardware, software and PCBdesign.
CO2: Importance of product test &testspecifications.
CO3:Special design considerations and importance ofdocumentation.

404185: Artificial Intelligence (Elective II)
CO1:Design and implement key components of intelligent agents and expert systems.
CO2: To apply knowledge representation techniques and problem solving strategies to common
AI applications.
CO3:Applyand integrate various artificial intelligence techniques in intelligent system development as well as understand the importance of maintaining intelligent systems.
CO4:Build rule-based and other knowledge-intensive problem solvers.

404185: Electronics in Agriculture (Elective II)
CO1:Understand Role of computers & virtual instrumentation.
CO2:Provide communication solution for interpreting environmental parameters with Electronics systems.
CO3:Describe Instrument technology used in agriculture.
CO4:Apply knowledge of Electronics in Agriculture.
CO5:Understand Greenhouse Technology & Role of Electronics Governance.

BE Sem II

404189 :Mobile Communication
CO1: The student should be able to apply the concepts of telecommunication switching, traffic and networks.
CO2: The student should be able to analyze the telecommunication traffic.
CO3: The student should be able to analyze radio channel and cellular capacity.
CO4: The student should be able to explain and apply concepts of GSM and CDMA system.

404190: Broadband Communication Systems
CO:To Identify the basic elements of fiber optics communication link,sources ,detectors, fiber modes & configuration.
CO2: To identify various losses along the optical link ,identify distortion & degradation of signals and To design Analog Link and Digital link budget to achieve SNR and BER of an optical communication system.
CO3 :To learn fundamentals of Satellite Communication system, fundamentals of orbital mechanics
CO4 :To Carry out Satellite Link design for Up Link and Down Link

404191 :Machine Learning (Elective III)

CO1: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.
CO2:To mathematically analyze various machine learning approaches and paradigms.
CO3:To implement convolution neural networks in recognition applications.

404191:Audio and Speech Processing (Elective III)

CO1:Design and implement algorithms for processing speech and audio signals considering the properties of acoustic signals and human hearing.
CO2: Analyze speech signal to extract the characteristic of vocal tract (formants) and vocal cords (pitch).
CO3: Analyze speech signal for extracting LPC and MFCC Parameters of speech signal.
CO4: 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.

404191: Software Defined Radio (Elective III)

CO1:Compare SDR with traditional Hardware Radio HDR.
CO2:Implement modern wireless system based on OFDM, MIMO & Smart Antenna.
CO3:Build experiment with real wireless waveform and applications, accessing both PHY and
MAC, Compare SDR versus MATLAB and Hardware Radio
CO4: Work on open projects and explore their capability to build their own communication System.

404192: ROBOTICS (Elective-IV)

CO1: Familiar with the history, concept development and key components of robotics technologies.
CO2: Implement basic mathematics manipulations of spatial coordinate representation and transformation.
CO3:Solve basic robot forward and inverse kinematic problems
CO4:Understand and able to solve basic robotic dynamics, path planning and control problems

404194 :Renewable Energy Systems (Elective-IV)

CO1:Interpret energy reserves of India and potential of different energy sources.
CO2:Measure the solar radiation parameters and performance of different solar collectors.
CO3:Calculate different parameters of wind turbine rotor.
CO4:Implicit the importance and applications of geothermal and ocean energy.
CO5:Demonstrate knowledge in field of fuel cell and potential for power generation.

404193: Lab Practice -III (MC+BCS)

CO1: Students should be able to set up and perform experiment on telecommunication switching and mobile communication and optical communication system.
CO2: As a part of their term work, students should visit the MTSO office and hence should be able to understand and observe actual switching systems and mobile communication technology.

CO3: Students should be able to design and set up Analog Link and Digital link of an optical communication system.
CO4: Students should be able to Establish a direct communication link between Uplink Transmitter and Downlink Receiver using tone signal, To establish an AUDIO-VIDEO satellite link between Transmitter and Receiver, to find out the link failure.

404195: Project Stage II
CO1. Identify, formulate and design the solution for engineering problem by investigating the literature.
CO2. apply appropriate modern tools, technologies or multidisciplinary approach to produce engineering solutions which will be beneficial to society and environment.
CO3. Demonstrate the project and communicate effectively in team, apply ethical ergonomic, and safety constraints in the project work.
CO4. Demonstrate knowledge and understanding of engineering and management principles and use it for life-long learning.

Audit Course 6 (2): Environmental Issues And Disaster Management
CO1:To learn the different environmental issues and disasters.
CO2:To deal with problems associated with environment and effectively handle the disasters.