Program Outcomes

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a

member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcome List (2015 Pattern)

C201:204181: Course Name: - **Signals and Systems**
On the completion of the course, student will be able to

C201.1	Perform the classification and different operations of signals
C201.2	Categorize the Systems based on their Input-output relations and Impulse response
C201.3	Obtain the response of LTI Systems using Convolution Integral and Convolution Sum
C201.4	Analyze the signals using Fourier Series, Fourier Transform and Laplace Transform
C201.5	Determine the probability of given event and different statistical parameters of Random Variables

C202A: 204182: Course Name: -**Electronic Devices and Circuits**
On the completion of the course, student will be able to

C202A.1	Describe fundamental concepts of Field Effect Transistor (JFET and MOSFET).
C202A.2	Explain FET circuits and its analysis.
C202A.3	Illustrate applications of FETs.
C202A.4	Describe voltage regulators.

C202B: 204182: Course Name: - **Electronic Devices and Circuits Lab.**
On the completion of the course, student will be able to

C202B.1	Demonstrate FET characteristics by its analysis.
C202B.2	Illustrate basic applications of FET.
C202B.3	Determine Performance parameters of negative and positive feedback amplifiers using FET.
C202B.4	Verify parameters of linear adjustable voltage regulator for given specifications.

C203A:204183: Course Name: -**Electrical Circuits and Machines**
On the completion of the course, student will be able to

C203A.1	Analyze basic AC & DC circuit for voltage, current and power by using KVL, KCL, and network theorems
C203A.2	Examine various performance parameters of the transformer.

C203A.3	Determine performance parameter of different types of DC & 3 phase AC Motors.
C203A.4	Identify appropriate electrical motor for given application.

C203B:204183: Course Name: -**Electrical Circuits and Machines Lab.**
On the completion of the course, student will be able to

C203B.1	Analyze the DC circuit using Thevenin's and Norton's Theorem.
C203B.2	Determine parameters of single phase transformer with the help of standard methods
C203B.3	Demonstrate effect of various parameters on performance of electrical motors BT-2
C203B.4	Explain the operation of special purpose motors and drives.

C204A: 204184: Course Name: - **Data Structures and Algorithms**
On the completion of the course, student will be able to

C204A.1	Describe the computational efficiency of the principal algorithms such as sorting & searching.
C204A.2	Write basic programs using array and pointers in C.
C204A.3	Illustrate linked lists and their applications.
C204A.4	Illustrate stack & queue for applications.
C204A.5	Apply various terminologies and traversals of trees for solving given problem.
C204A.6	Apply various terminologies ,traversals of graphs for solving given problem

C204B: 204184: Course Name: - **Data Structures and Algorithms Lab**.
On the completion of the course, student will be able to

C204B.1	Implement various problem statements using C programming language.
C204B.2	Apply C programs for implementation of linear data structures (Stack, Queue and Linked list).
C204B.3	Apply concepts of linear data structure to implement its application.
C204B.4	Execute non-linear data structures (tree, graph) for solving given problem using C.

C205A: 204185: Course Name: **Digital Electronics**
On the completion of the course, student will be able to

C205A.1	Demonstrate the basic logic gates and various variable reduction techniques of digital logic circuit(unit I)
C205A.2	Design various sequential circuits and counters(Unit II)
C205A.3	Design synchronous sequential models and state Machines(Unit III)
C205A.4	Describe PLDS, TTL and CMOS with its applications (Unit IV,V)
C205A.5	Explain the architecture and features of Microcontroller 8051. (Unit VI)

C205B: 204185: Course Name: **Digital Electronics Lab.**
On the completion of the course, student will be able to

C205B.1	Implement different Combinational Circuits like Multiplexer, demultiplexer, BCD adder, Subtractor and Comparator.
C205B.2	Construct different Sequential Circuits like Shift register and counter.

C205B.3	Compare theoretical and practical parameters for TTL and CMOS.
C205B.4	Implement simple programs on memory transfer with microcontroller 8051 using Keil IDE

C206: 204186: Course Name: - **Electronic Measuring Instruments and Tools Lab.**
On the completion of the course, student will be able to

C206.1	Describe specifications, features and capabilities of electronic instruments.
C206.2	Compare measuring instruments for performance parameters
C206.3	Select right instrument for the purpose of measurement under different conditions.
C206.4	Use modern tools necessary for electronic projects.

207A: Course Name: C204192-**Audit Course-I-Japanese Module-1**

On the completion of the course, student will be able to

C207A.1	Name the colors, days of week in Japanese language
C207A.2	List few words in Hiragana
C207A.3	Use greetings, expressions in Japanese
C207A.4	Enlist numbers, months, dates using Japanese language expressions

C207B: Course Name: C204192-**Audit Course 1- Road Safety Management**

On the completion of the course, student will be able to

C207B.1	Explain importance of the road safety.
C207B.2	Apply road safety management techniques.
C207B.3	Take preventive measures to avoid accidents.
C207B.4	Create awareness among the public to reduce financial penalties through remedial education.

C208:207005: Course Name: – **Engineering Mathematics-III**

On the completion of the course, student will be able to

C208.1	Solve higher order linear Differential equations for various engineering problems like L-C-R electrical circuits.
C208.2	Apply Fourier transform and Z-transform to various engineering problems.
C208.3	Use different Numerical techniques for Differentiation, Integration, and solution of Differential equations.
C208.4	Apply vector differentiation and integration to various vector fields.
C208.5	Analyze conformal mappings, contour integration and transformations of complex functions.

C209A: 204187: Course Name: – **Integrated Circuits**

On the completion of the course, student will be able to

C209A.1	Explain internal structure and characteristics of Op-Amp.
C209A.2	Determine various performance parameters of op-amp with their significance
C209A.3	Analyze linear and nonlinear applications of Op-Amp
C209A.4	Design converters, Oscillators, PLL and filters using Op-amp

C209B: 204187: Course Name: – **Integrated Circuits Lab.**

On the completion of the course, student will be able to

C209B.1	Analyze op amp parameters by comparing them with ideal values.
C209B.2	Demonstrate various linear and non-linear applications of op amp
C209B.3	Demonstrate PLL, ADC and DAC using op amp
C209B.4	Demonstrate ADC and DAC using op amp

C210: 204188: Course Name: – **Control Systems**

On the completion of the course, student will be able to

C210.1	Describe the elements of control systems and their modeling using various techniques
C210.2	Determine the system stability using time and frequency response
C210.3	Analyze systems using state space representation techniques
C210.4	Explain the concept of controllers and sampled data systems

C211A:204189: Course Name: –: **Analog Communication**

On the completion of the course, student will be able to

C211A.1	Describe fundamental concepts, various components and modulation schemes of analog communication systems
C211A.2	Illustrate demodulation techniques and the performance parameters of analog receivers
C211A.3	Explain various types of noise and its effect on the performance of communication systems
C211A.4	Explain the sampling theorem, various pulse and Digital modulation techniques

C211B:204189: Course Name: –: **Analog Communication Lab.**

On the completion of the course, student will be able to

C211B.1	Demonstrate various modulation techniques
C211B.2	Verify the Sampling Theorem and aliasing effect
C211B.3	Measure various performance parameters of analog receiver
C211B.4	Generate AM, FM and sampling of a signal using simulation tool

C212A: 204190: Course Name: – **Object Oriented Programming**

On the completion of the course, student will be able to

C212A.1	Describe the principles of object oriented programming for applying the concepts of data encapsulation, inheritance using C++ and Java.
C212A.2	Implement basic programs in Java.
C212A.3	Use the concept of packages, interfaces, multithreading and exception handling for programs implementation in Java.
C212A.4	Apply the concepts of Java Applet in Java for developing user friendly programs.

C212B: 204190: Course Name: – **Object Oriented Programming Lab**

On the completion of the course, student will be able to

C212B.1	Write programs in C++ and Java for the given problem using function and reference variable.
C212B.2	Demonstrate classes, objects and operator overloading using C++ and Java.
C212B.3	Execute programs using inheritance in Java.
C212B.4	Use Packages, exception handling and Multithreading using Java.

C213: 204191: Course Name: –**Employability Skill Development**
On the completion of the course, student will be able to

C213.1	Solve creative and mental arithmetic problems.
C213.2	Illustrate good verbal, non- verbal and written communication skills.
C213.3	Elaborate solutions of real life problems.
C213.4	Demonstrate self-introspection methods.

C214A: Course Name: 204193 – **Audit Course – II: Japanese Module-II**
On the completion of the course, student will be able to

C214A.1	Name the objects (nominal things) in Japanese language.
C214A.2	List few words in katakana
C214A.3	Express time in Japanese
C214A.4	Enlist objects, places using Japanese language

C214B: Course Name: 204193 – **Audit Course – II: Cyber Crime & Law**
On the completion of the course, student will be able to

C214B.1	Define cybercrime & cyber laws
C214B.2	Classify different types of cyber crime
C214B.3	Elaborate different types of Computer Crimes
C214B.4	Recognize investigation technique of cybercrime.

C301:304181: Course Name: - **Digital Communication**
On the completion of the course, student will be able to

C301.1	Describe the fundamentals of Digital Communication System and mathematical background for communication signal analysis
C301.2	Analyze digital modulation techniques in time & frequency domain
C301.3	Calculate the error performance of a base band & passband digital communication system in presence of noise & other interferences
C301.4	Compare different types of Spread Spectrum techniques

C302: 304182: Course Name: -**Digital Signal Processing**
On the completion of the course, student will be able to

C302.1	Explain fundamentals of Digital signal processing, sampling and aliasing effect, mapping of analog frequencies to digital frequencies.
C302.2	Analyze discrete time signals and LTI-DT systems using different transforms.
C302.3	Design digital filters and realize using different filter structures. (Scope is up to calculation of values.
C302.4	Describe various real world applications of DSP.

C303:304183: Course Name: -**Electromagnetics**
On the completion of the course, student will be able to

C303.1	Explain the basic mathematical concepts related to electromagnetic vector fields.
C303.2	Apply the principles of Electrostatic or Magneto static to solve the problems related to Electromagnetic field.
C303.3	Use the concepts Maxwell's equations to explain time varying electromagnetic field.
C303.4	Analyze the transmission line parameters
C303.5	Explain the behavior of uniform plane wave in different medium (6)

C304:304184: Course Name: - **Microcontrollers**
On the completion of the course, student will be able to

C304.1	Explain the architecture and features of Microcontroller 8051 and PIC 18F
C304.2	Develop interfacing to real world devices using Microcontroller 8051 and PIC 18F
C304.3	Explain use of hardware and software tools for developing applications
C304.4	Design an embedded application using microcontroller

C305: 304185: Course Name: - **Mechatronics**
On the completion of the course, student will be able to

C305.1	Illustrate the key elements of Mechatronics system
C305.2	Explain the basic principle of Sensors and Transducers
C305.3	Compare different actuators for Mechatronics application
C305.4	Elaborate mechatronics systems used in automobiles

C306:304191: Course Name: **Signal Processing and Communications Lab (DC/DSP) Lab**
On the completion of the course, student will be able to

C306.1	Demonstrate different modulation techniques in presence of noise along with their spectral analysis.
C306.2	Demonstrate DF and PN sequence along with their spectral analysis.
C306.3	Examine the Sampling Theorem and aliasing effect.
C306.4	Analyze discrete time signals and systems using different transforms.
C306.5	Demonstrate characteristics of FIR and IIR filters using different filter design techniques.

C307:304192: Course Name: **Microcontrollers and Mechatronics Lab**
On the completion of the course, student will be able to

C307.1	Apply assembly language to interface real world devices with 8051 microcontroller using 8051 IDE.
C307.2	Apply embedded C language to interface real world devices with PIC18F microcontroller using MP-LAB IDE.
C307.3	Determine Sensor performance parameter with the help of experimental set up.
C307.4	Demonstrate basic working principle of Hydraulic and Pneumatic systems.

C308: 304193: Course Name: -: **Electronics System Design**
On the completion of the course, student will be able to

C308.1	Apply the fundamental concepts and working principles of electronics devices to design electronics systems for the given specifications.
C308.2	Select appropriate components and devices by interpreting the datasheets
C308.3	Design the circuit schematic of an electronic system/sub-system for the given specifications.
C308.4	Use an EDA tool to validate performance of circuit schematic or suitable tool for database management system.

C309A: Course Name: -**Japanese Module-III**
On the completion of the course, student will be able to

C309A.1	Name the objects in Japanese language. (BTL 1: Remembering)
C309A.2	List few kanji's used in Japanese language.
C309A.3	List types of adjectives in Japanese language
C309A.4	Describe persons & cities using Japanese language.

C309B: Course Name: - Audit Course – III: **Cyber and Information Security**
On the completion of the course, student will be able to

C309B.1	Describe basics of cyber laws and various intelligent property issues
C309B.2	Identify fundamental things in information security
C309B.3	Explain various security issues and its management
C309B.4	Improve written and presentation skills related to cyber security

C310:304186: Course Name: - **Power Electronics**
On the completion of the course, student will be able to

C310.1	Explain different power devices, their construction, characteristics and triggering circuits.
C310.2	Analyze performance of AC voltage controllers, controlled rectifiers, inverters, DC choppers for different loads.
C310.3	Describe working of different resonant converters, protection circuits & EMI minimizing techniques.
C310.4	Elaborate different motor drives, & various power electronics applications like UPS, SMPS, etc.

C311: 304187: Course Name: – **Information Theory, Coding and Communication Networks**

On the completion of the course, student will be able to

C311.1	Apply information theory to communication systems and source coding techniques.
C311.2	Explain fundamentals of channel coding.
C311.3	Perform channel coding for error detection and correction.
C311.4	Describe basic concepts of data communication and networking.

C312: Course Name: C304188 – **Business Management**

On the completion of the course, student will be able to

C312.1	Describe basics of business management with various management functions, principles and levels.
C312.2	Describe different aspects of quality, finance and process of project management.
C312.3	Explain major tasks in business management such as human resource and marketing management
C312.4	Explain process of entrepreneurship development

C313: 304189: Course Name: – **Advanced Processors**

On the completion of the course, student will be able to

C313.1	Explain the ARM processors, its architectures and features.
C313.2	Explain the features of ARM7 based LPC2148 microcontroller.
C313.3	Illustrate programming skills for interfacing different peripherals to ARM7 based LPC2148 microcontroller
C313.4	Explain the DSP processors, its architectures and features.

C314: 304190: Course Name: –**System Programming and Operating Systems**

On the completion of the course, student will be able to

C314.1	Explain fundamentals of system programming and design concepts of Assembler, Compiler, Loaders and Linkers.
C314.2	Describe the implementation various process scheduling techniques and deadlock avoidance schemes in operating system
C314.3	Analyze various memory management and allocation methods
C314.4	Describe the management of input output devices and file system

C315: 304194: Course Name: – **Power and ITCT Lab**

On the completion of the course, student will be able to

C315.1	To analyze the characteristics of various power devices and their applications.
C315.2	To demonstrate power converters with various loads.
C315.3	To describe various protection circuits for power devices and circuits.
C315.4	To demonstrate Information Theory, various Coding Techniques and Data Communication Networks using C / MATLAB / SciLab.
C315.5	To describe applications of Data Communication and Networking.

C316: 304195: Course Name: – **Advanced Processors and System Programming Lab**

On the completion of the course, student will be able to

C316.1	Implement design of various language processors like; Lexical Analyzer, Assembler, MACRO Processor.
C316.2	Demonstrate implementation of operating system concepts like; job scheduling, bankers, and page replacement algorithm.
C316.3	Demonstrate interfacing of real world devices with LPC2148 using Keil
C316.4	Use embedded C language to perform signal processing operations using TMS320C6713 DSP processor in code composer studio

C317: 304196: Course Name: – **Employability Skills and Mini Project**

On the completion of the course, student will be able to

C317.1	Identify a need-based project to be executed as a team with systematic planning
C317.2	Develop mini project (product) with PCB artwork design, soldering techniques, trouble shooting and necessary software tools.
C317.3	Prepare a technical report based on the Mini project.
C317.4	Deliver technical seminar based on the Mini Project work carried out.

C318A: Course Name: –**Audit Course-IV- Japanese Module -4**

On the completion of the course, student will be able to

C318A.1	Name the objects counters in Japanese language. (BTL 1- Remembering)
C318A.2	List few verbs in Japanese. (BTL 1- Remembering)
C318A.3	Enlist interrogative words in Japanese. (BTL 1- Remembering)
C318A.4	Tell action verbs using Japanese language.

C318B: Course Name: – **Audit Course-IV: Embedded System Design using MSP430**
On the completion of the course, student will be able to

C318B.1	Explain Architecture and features of MSP430
C318B.2	Elaborate Embedded C programming techniques for 16-bit microcontroller
C318B.3	Describe various Embedded protocols and its interfacing techniques
C318B.4	Describe Embedded Wireless networking concepts and its implementation

C401: Course Name: C404181 – **VLSI Design and Technology**
On the completion of the course, student will be able to

C401.1	Model the fundamental blocks of a VLSI circuits using VHDL. (Unit I) (level 3, Apply)
C401.2	Apply knowledge of real time issues for design of digital circuits and its testability. (Unit II and VI) (level 3, Apply)
C401.3	Design of digital CMOS circuits for specified applications. (Unit IV) (level 6, Create)
C401.4	Describe PLDs and various issues in design of an ASIC. (Unit III & V) (level 2, Understand)

C402: Course Name: C404182 – **Computer Networks and Security**
On the completion of the course, student will be able to

C402.1	Describe TCP/IP model with protocols
C402.2	Explain duties of various layers and different protocols involved in computer networking
C402.3	Analyze the requirements for a given organizational structure to select the appropriate networking architecture
C402.4	Explain the cryptography and network security.

C403: Course Name: C404183 – **Radiation & Microwave Techniques**
On the completion of the course, student will be able to

C403.1	Calculate the performance parameters of radiating elements and antenna arrays by using fundamentals of radiation theory.
C403.2	Analyze the microwave transmission lines, rectangular cavity resonator
C403.3	Describe the construction and working of passive and active microwave devices.
C403.4	Explain Microwave Systems, applications and it's measurement techniques

C404A: Course Name: C404184 – **Elective – I - Digital Image and Video Processing**
On the completion of the course, student will be able to

C404A.1	Describe the fundamentals of DIP from human visual perception to image formation model.
C404A.2	Demonstrate fundamental concepts of low level image processing .(Unit II, III)
C404A.3	Apply image processing techniques for object segmentation and recognition (Unit IV,V)
C404A.4	Describe video signal representation and different algorithm for video processing.

C404B: Course Name: C404184 – **Elective – I –Internet of Things**
On the completion of the course, student will be able to

C404B.1	Explain the various concepts, terminologies and architecture of IoT systems .
C404B.2	Illustrate elements and roles of sensor network in IoT.
C404B.3	Describe various protocols for design of IoT systems.
C404B.4	Describe various techniques of data storage and data analytics.
C404B.5	Elaborate real time applications of Internet of Things

C405A: Course Name: C404185 – **Elective – II - Electronic Product Design**
On the completion of the course, student will be able to

C405A.1	Describe the various considerations of product development from designer and user point of view.
C405A.2	Elaborate the different stages involved in hardware, software and PCB design for system development.
C405A.3	Describe different testing methods and debugging processes for system development
C405A.4	Explain the need and methods of documentation in product design.

C405B: Course Name: C404185 – **Elective – II - Artificial Intelligence**
On the completion of the course, student will be able to

C405B.1	Explain Intelligent agents and search strategies to solve problems.
C405B.2	Solve problems related to certain and uncertain knowledge.
C405B.3	Illustrate various types of learning and pattern recognition techniques.
C405B.4	Describe the significance of natural language processing.

C406: Course Name: C404186 – **Lab. Practice-I (CNS+RMT)**

On the completion of the course, student will be able to

C406.1	Demonstrate installation and configuration of protocols in TCP/IP protocol suite.
C406.2	Apply encryption and decryption algorithms for cryptography.
C406.3	Determine various performance parameters of antennas, antenna arrays and microwave devices using experimental set up and simulation software.
C406.4	Measure the characteristics of microwave sources by generating microwave signal and using test bench setup.

C407: Course Name: 404187 – **Lab Practice-II (VLSI+IOT)**

On the completion of the course, student will be able to

C407.1	Implement digital circuits with HDL in FPGA
C407.2	Design CMOS layout for digital circuits using 'Microwind Simulation" software.
C407.3	Explain different types of boards , IOT platforms used for controlling and monitoring things using internet
C407.4	Demonstrate interfacing of real world devices with different development board for implementing Internet of Things (IoT System)

C408: Course Name: C404188 – **Project Stage-I**

On the completion of the course, student will be able to

C408.1	Schedule the project work and designate responsibility of every member in the team.
C408.2	Identify need based project idea considering societal & environmental context.
C408.3	Perform market, literature, technological and research survey along with budget estimation.
C408.4	Finalize design approach, component / algorithm selection and circuit schematic.
C408.5	Implement the project module-wise.
C408.6	Present prepared technical documents based on implemented project work.

C409: Course Name: **Audit Course 5– Human Behavior**

On the completion of the course, student will be able to

C409.1	Explain importance of Human relationships
C409.2	Identify need of harmony in family & Society.
C409.3	Develop time management and leadership skills
C409.4	Explain significance of Professional ethics.

C410: Course Name: C404189 – **Mobile Communication**

On the completion of the course, student will be able to

C410.1	Apply the concepts of switching techniques and traffic engineering to telecom networks.
C410.2	Analyze radio channel, system capacity and wave propagation mechanisms.
C410.3	Explain the GSM fundamentals, channels, services and CDMA systems.
C410.4	Describe Long Term Evolution (LTE) and 5G Networks.

C411: Course Name: C404190 – **Broadband Communication Systems**
On the completion of the course, student will be able to

C411.1	Explain working principles of the key components of Fiber Optic Communication system.
C411.2	Estimate Power and Rise Time Budgets for a typical fiber optic link
C411.3	Discuss working principle of optical Amplifier, WDM and its components.
C411.4	Describe various satellite subsystems, key components and Orbital effects in Satellite Communication Systems.
C411.5	Estimate satellite link budget for up-link, down-link, and overall link.

C412A: Course Name: C404191 – **Elective – III–Audio and Video Engineering**
On the completion of the course, student will be able to

C412A.1	Explain the fundamentals of Color Television and different TV standards
C412A.2	Describe various Digital TV systems and recording with compression techniques.
C412A.3	Describe various advanced TV systems
C412A.4	Explain fundamentals of acoustic systems and various recording techniques.

C412B: Course Name: C404191 – **Elective – III–Machine Learning**
On the completion of the course, student will be able to

C412B.1	Explain basic concepts in Machine Learning and its types.
C412B.2	Apply regression and classification techniques to supervised learning problems
C412B.3	Illustrate dimensionality reduction and Clustering algorithms.
C412B.4	Use Artificial Neural Networks for Classification.
C412B.5	Explain Deep Learning and Convolutional Neural Networks.

C412C: Course Name: C404191 – **Elective – III - PLC & Automation**
On the completion of the course, student will be able to

C412C.1	Describe Architecture of Industrial Automation.
C412C.2	Design Signal Conditioning Circuits for various applications.
C412C.3	Identify final control elements for the real time system.
C412C.4	Demonstrate PLC programming skills for various industrial applications.
C412C.5	Explain the functionality of SCDA, HMI, DCS and networking in automation.

C413A: Course Name: C404192 – **Elective – IV - Wireless Sensor Networks**
On the completion of the course, student will be able to

C413A.1	Explain basic concepts used in wireless sensor networks.
C413A.2	Compare various standards and protocols associated with wireless sensor networks.
C413A.3	Describe the security, localization, data aggregation and routing techniques used in wireless sensor networks.
C413A.4	Explain the issues involved in design and deployment of WSN application.

C413B: Course Name: C404192 – **Elective – IV –Robotics**
On the completion of the course, student will be able to

C413B.1	Explain the basic concepts, key components and development in robotics.
C413B.2	Compare the working of different Drivers, Sensors, End Effectors and Actuators used in Robotics.
C413B.3	Solve basic robot forward and inverse kinematic problems using mathematical manipulation of spatial coordinate representation and transformation.
C413B.4	Apply different programming methods for development and building a robot.

C413C: Course Name: C404192 – **Elective – IV –Renewable Energy Systems**
On the completion of the course, student will be able to

C413C.1	Explain various energy reserves of India and potential of different energy sources.
C413C.2	Calculate the solar radiation parameters and performance of different solar collectors and explain working of solar photovoltaic cell.
C413C.3	Calculate different parameters of wind turbine rotor.
C413C.4	Describe the importance and applications of geothermal and ocean energy and power generation using fuel cells

C414: Course Name: C404193 – **Lab Practice-III (MC+BCS)**
On the completion of the course, student will be able to

C414.1	Verify characteristics of Optical Sources, Optical detectors and fibers with experiment set up
C414.2	Establish a point-to-point communication using optical fiber link and satellite transceiver
C414.3	Estimate power budget, rise time budget for Optical and satellite communication system
C414.4	Demonstrate the working of PSTN-TST Switch, GSM, CDMA system, and VoIP Call Routing.
C414.5	Determine the GoS of Telecommunication Networks and BER for multipath Propagation channel models.

C415A: Course Name: C404194 – **Lab Practice-IV (Elective-III-Audio and Video Engineering)**
On the completion of the course, student will be able to

C415A.1	Demonstrate Voltage and waveform analysis for TV using pattern generator.
C415A.2	Elaborate various advanced TV systems.
C415A.3	Apply different standards of compression techniques for audio, image and video.
C415A.4	Explain various Audio systems.

C415B: Course Name: C404194 – **Lab Practice-IV (Elective-III-Machine Learning)**
On the completion of the course, student will be able to

C415B.1	Explain basic concepts in Machine Learning and its types.
C415B.2	Apply regression and classification techniques to supervised learning problems
C415B.3	Illustrate dimensionality reduction and Clustering algorithms.
C415B.4	Use Artificial Neural Networks for Classification.
C415B.5	Explain Deep Learning and Convolutional Neural Networks.

C415C: Course Name: C404194 – **Lab Practice-IV (Elective-III-PLC and Automation)**
On the completion of the course, student will be able to

C415B.1	Implement various motor controls using PLC.
C415B.2	Determine final control element in PLC application.
C415B.3	Execute simulation of pneumatic kit.
C415B.4	Detect shaft angle using encoder.

C416: Course Name: C404195 – **Project Stage-II**
On the completion of the course, student will be able to

C416.1	Assemble the modules of the project.
C416.2	Test the project with troubleshooting and debugging.
C416.3	Evaluate the performance of the project.
C416.4	Demonstrate a cost effective project with enclosure design as a prototype or product.
C416.5	Present prepared technical documents based on the project.

C417: Course Name: Audit-VI - **Environmental Issues and Disaster Management**
On the completion of the course, student will be able to

C417.1	Explain effects of different environmental issues like Pollution
C417.2	Discuss concepts of ecosystem, biodiversity and its conservation
C417.3	Explain various natural disasters and its effects
C417.4	Describe the ways to handle the Natural disasters