



MARATHA VIDYA PRASARAK SAMAJ'S

Karmaveer Adv. Baburao Ganpatrao Thakare
College of Engineering (An Autonomous Institute)



Permanently Affiliated to Savitribai Phule Pune University Vide Letter No. : CA/1542 & Approved by AICTE New Delhi - Vide Letter No. : 740-89-32 (E) ET/98 AISHE Code - C-41622

Instrumentation & Control Engineering Department

Vision

To be an accredited department of preferred choice among common masses in the multidisciplinary field of automation and control engineering.

Mission

- M1. To prepare competent professionals to meet current and future demands of industry, academia and society of multidisciplinary field of automation.
- M2. To strengthen collaboration with reputed industries and institute of global insight.
- M3. To inculcate spirit of research and entrepreneurship amongst the students.

Program Educational Objectives

- To build core competency in the multidisciplinary field of automation to cater the industry and research needs.
- Develop multi-disciplinary skills, team spirit and leadership qualities with ethics, to excel in professional career and higher studies in Instrumentation and Control Engineering.
- To learn and apply contemporary technologies for addressing impending challenges for the benefit of organizations and society.

Program Outcomes

PO1:	Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
PO2:	Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
PO3:	Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
PO4:	Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
PO5:	Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
PO6:	The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
PO7:	Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
PO8:	Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
PO9:	Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
PO10:	Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
PO11:	Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technological change.

Knowledge and Attitude Profile (WK)

WK1:	A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.
WK2:	Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.
WK3:	A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.
WK4:	Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.
WK5:	Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.
WK6:	Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.
WK7:	Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.
WK8:	Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.
WK9:	Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

Program Specific Outcomes

PSO1:	Students will have a strong foundation in mathematical, scientific, engineering and management fundamentals necessary to formulate, solve and analyze complex instrumentation problems.
PSO2:	Apply instrumentation & control in multidisciplinary domains related to research & entrepreneurship development.
PSO3:	Communicate effectively to work as a team with professional ethics for the benefit for society.

Course Outcomes for
S.Y. B.Tech. 1033024 Course, Semester-I

Course Code	Sensors and Transducers (103301)
C103301.1	Demonstrate displacement, velocity, force and torque sensors and transducers.
C103301.2	Apply pressure sensors and transducers for given application.
C103301.3	Select temperature sensors for a given application.
C103301.4	Select flow sensor for the given fluid flow measurement.
C103301.5	Demonstrate miscellaneous sensors according to their working principles.

Course Code	Control System Components (103302)
C103302.1	Verify logic gates truth tables using relays.
C103302.2	Read and interpret electrical wiring diagrams for electric motors and motor control centers.
C103302.3	Interpret hazardous area classification as per National Electrical Code (NEC) standards.
C103302.4	Select power devices such as MOSFETs and IGBTs in real world applications.
C103302.5	Analyze pneumatic and hydraulic circuits.

Course Code	Electronic Instrumentation (103303)
C103303.1	Apply the fundamentals of instrumentation in measurements and calibration of instruments.
C103303.2	Demonstrate extension of ammeter and voltmeter measurement range.
C103303.3	Make use of appropriate method for measurement of R, L and C.
C103303.4	Select appropriate type of ADCs and DACs in different applications.

C103303.5	Utilize electronic instruments for different applications.
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Course Code	Engineering Mathematics-III (170304A)
C170304A.1	Solve higher order linear differential equations using appropriate techniques.
C170304A.2	Apply Laplace transform and Z-Transform to solve differential equations, difference equations.
C170304A.3	Apply vector calculus concepts to analyze problems and solve system of linear equations by using numerical methods.
C170304A.4	Analyze discrete and continuous random variables using Binomial, Poisson and Normal distributions.
C170304A.5	Analyze data through hypothesis tests like Chi-square and t-tests.

Course Code	Artificial Intelligence (170404B)
C170304B.1	Explain the basic principles and scope of Artificial Intelligence and its relevance to different engineering disciplines.
C170304B.2	Apply search algorithms for solving simple engineering problems.
C170304B.3	Understand and differentiate between types of machine learning and data representations.
C170304B.4	Identify and analyze AI applications in domains such as predictive maintenance, smart cities, automation, and control systems.
C170304B.5	Recognize ethical, social, and professional issues in deploying AI solutions in engineering contexts.

Course Code	Intellectual Property Rights and Ethics (171305A)
C171305A.1	Understand the basics of intellectual property rights.
C171305A.2	Learn the patent filing process.
C171305A.3	Understand the copyright/trademark/industrial design and filing process.

C171305A.4	Understand the importance of ethics in their personal and professional life.
C171305A.5	Learn the workplace responsibilities and rights as an engineer in the industry.

Course Code	Renewable Energy (171305B)
C171305B.1	Describe the basics of renewable energy.
C171305B.2	Explain the constructional details and working of hydro-electric power plant.
C171305B.3	Describe the fundamentals and technology to harness solar energy.
C171305B.4	Explain the wind energy conversion system.
C171305B.5	Discuss the bio-energy conversion pathways.

Course Code	Health, Care and Management Systems (171305C)
C171305C.1	Understand the structure and function of key human body systems relevant to healthcare and diagnosis.
C171305C.2	Identify common health issues and explain their causes, symptoms.
C171305C.3	Describe the working principles and applications of basic biomedical instruments used in diagnosis and monitoring.
C171305C.4	Analyze the role of advanced medical devices and imaging systems in clinical decision-making and treatment.
C171305C.5	Explain the components of hospital management system and significance of digital health technologies like Electronic Health Records (EHR), telemedicine and emergency tracking.

Course Code	Smart City and Infrastructure (171305D)
C171305D.1	Describe the concept, features, and components of smart cities with relevant examples.
C171305D.2	Demonstrate the structure and regulatory mechanisms of smart city development in context of Indian and international benchmarks.

C171305D.3	Apply GIS and remote sensing techniques for spatial analysis and infrastructure planning in smart cities.
C171305D.4	Relate smart transportation technologies and their role in improving urban mobility and sustainability.
C171305D.5	Suggest smart solutions for urban water, air and waste management using IOT technologies.

Course Code	Entrepreneurship Development (172306)
C172306.1	Explain the concept of entrepreneurship and its importance in economic and social development.
C172306.2	Identify, evaluate, and validate innovative business ideas using market research techniques.
C172306.3	Analyze startup funding options, revenue models, and financial feasibility of new businesses.
C172306.4	Demonstrate the ability to pitch business ideas effectively to potential stakeholders.
C172306.5	Develop a structured business plan incorporating all key aspects of entrepreneurship.

Course Code	Business Economics (172406)
C172406.1	Understand the role of economics in business decision-making and analyze real-world economic scenarios.
C172406.2	Apply demand and supply principles to determine market equilibrium and pricing strategies.
C172406.3	Analyze cost structures, profitability and break-even points in business operations.
C172406.4	Evaluate the impact of business cycles, inflation, and government economic policies on industries.
C172406.5	Develop pricing strategies based on competitive analysis and consumer demand.

Course Code	Universal Human Values (173307)
C173307.1	Explore a holistic vision of life, including the self and surroundings.

C173307.2	Recognize the co-existence of self, realize harmony, and comprehend the true happiness.
C173307.3	Apply strategies that foster harmony in family and society through effective communication and relationship-building to cultivate social well-being.
C173307.4	Execute self-regulations to mutually fulfilling human behavior and enriching interaction with nature to realize harmony.
C173307.5	Emphasize the implications of a holistic approach in terms of ethical human conduct, and transit towards value based life.

Course Code	Environmental Studies (173407)
C173407.1	Describe the importance of environmental studies and the sustainable use of natural resources.
C173407.2	Explain the structure and function of ecosystems and the significance of biodiversity.
C173407.3	Identify various types of environmental pollution and their control measures.
C173407.4	Discuss key environmental issues, policies and their impact on society.
C173407.5	Observe and report environmental conditions and features through field activities.

Course Code	Community Engagement / Field Projects (103308)
C173308.1	Explore relevance between theory and practice through community-based problem learning.
C173308.2	Identify real-life socio-technical problems and develop the solution.
C173308.3	Implement a wisdom of empathy and social responsibility to meet complex global challenges.
C173308.4	Develop innovative ideas in collaboration with society through community-based research methods.
C173308.5	Analyze the need of research projects and develop a plan for betterment of public service values through active citizenship.

S.Y. B.Tech. 1033024 Course, Semester-II

Course Code	Process Control (103401)
C103401.1	Analyze process variables, control system types, and process characteristics, and evaluate examples of process control loops in industry.
C103401.2	Apply knowledge of transmitters, signal standards, protocols, and converters to evaluate their role in process control systems.
C103401.3	Design and apply control actions and tuning methods to optimize controller performance and system stability.
C103401.4	Evaluate control valve selection, sizing, and design based on key characteristics and industry standards.
C103401.5	Analyze and evaluate valve accessories and actuators for optimal performance in process control systems.

Course Code	Analog and Digital Circuits (103402)
C103402.1	Design linear applications using an operational amplifier.
C103402.2	Design non-linear and special purpose applications using operational amplifiers and special purpose ICs.
C103402.3	Design combinational digital circuits using logic gates.
C103402.4	Demonstrate sequential logic circuits used in shift registers and counters.
C103402.5	Design synchronous, asynchronous sequential, and non-sequential counters.

Course Code	Control Systems (103403)
C103403.1	Differentiate between various types of control systems such as open-loop and closed-loop, linear and nonlinear, time-variant and time-invariant, and stable and unstable systems.
C103403.2	Determine the mathematical model of physical systems using differential equation and Laplace transform.
C103403.3	Solve the complicated control system using block diagram algebra and signal flow graph techniques.

C103403.4	Analyze the first, second order control systems performance based on the time domain specifications.
C103403.5	Investigate the stability of the control systems in time domain using root locus approach.

Course Code	Introduction to Cyber Security (171405A)
C171405A.1	Explain the architecture, communication and governance of cyberspace and web technologies.
C171405A.2	Identify and relate specific cybercrime incidents to relevant provisions of the IT Act 2000.
C171405A.3	Apply basic practices to ensure privacy and security on social media platforms.
C171405A.4	Apply security practices and legal guidelines to ensure safe E-Commerce and digital payment systems.
C171405A.5	Demonstrate configuration and management of secure digital devices and tools.

Course Code	Foreign Languages (174408)
C174408.1	Learn the basic phonetics, alphabets and sounds of the selected foreign language.
C174408.2	Interpret and use everyday vocabulary to manage simple social interaction.
C174408.3	Form simple sentences using basic grammatical structures and sentence patterns.
C174408.4	Participate in simple conversations and everyday communication situations relevant to academic, social and professional contexts.
C174408.5	Demonstrate cultural awareness and appropriate language behaviour to facilitate global and cross-cultural interactions.

Course Code	Systems Modeling and Simulation (103409)
C174409.1	Understand the fundamentals of modeling and simulation and their significance in instrumentation and control engineering.

C174409.2	Develop mathematical models of electrical, mechanical, and electromechanical systems using fundamental engineering principles.
C174409.3	Analyze the dynamic response of physical systems using time-domain approach.
C174409.4	Simulate control systems using MATLAB/Simulink, LabVIEW and interpret system behavior for standard input.
C174409.5	Design and evaluate control strategies (e.g., P, PI, PD and PID controllers) for control systems through simulation experiments.

T.Y. B.Tech. 1033024 Course, Semester-I

Course Code	Industrial Automation (103501)
CO103501.1	Understand the fundamentals of Industrial Automation and basics of PLC.
CO103501.2	Develop Ladder Program using basic PLC instructions for Sequential processes using digital I/O, logic gates, timers, and counters for industrial processes.
CO103501.3	Design advanced PLC applications using sequential control, comparison, arithmetic, and data-handling instructions.
CO103501.4	Implement analog processing, perform basic PID control, and interface PLCs with VFDs and motion-control systems.
CO103501.5	Develop HMI/SCADA system for given applications.

Course Code	Modern Control Theory (103502)
CO103502.1	Develop state-space models of physical systems and relate them with Transfer-Function.
CO103502.2	Solve the state equations for continuous-time systems using analytical method.
CO103502.3	Investigate the controllability, observability, Sterilizability and detectability of linear systems.
CO103502.4	Analyze the system stability using eigenvalue analysis and Lyapunov's direct method and apply the stability criterion to LTI systems.

CO103502.5	Design state feedback controllers and full order state observer for performance improvement of modern control systems.
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Course Code	Embedded System Design (103503)
CO103503.1	Explain the architecture, pin functions, timing, and memory organization of 8051 microcontroller.
CO103503.2	Analyze interfacing mechanisms for I/O ports, external memory, and stack operations.
CO103503.3	Develop assembly and Embedded-C programs using 8051 instruction set, addressing modes and directives.
CO103503.4	Apply timers, counters, interrupts, and serial communication for embedded applications.
CO103503.5	Demonstrate and implement microcontroller-based systems for interfacing sensors, displays, motors, and peripherals.

Course Code	Analytical Instrumentation (103504A)
CO103504A.1	Apply principles to classify analytical instruments and use temperature measurement devices with AI-based quality checks.
CO103504A.2	Interpret spectroscopic laws and examine UV-Visible and emission instruments with their components.
CO103504A.3	Differentiate GC and HPLC systems by evaluating components and separation performance.
CO103504A.4	Assess gas analyzers and pollution instruments based on operating principles and data interpretation.
CO103504A.5	Apply membrane separation and mass spectrometry techniques in suitable applications.

Course Code	Biomedical Instrumentation (103504B)
CO103504B.1	Apply bioelectric signal concepts to utilize electrodes, data acquisition systems, and comply with medical safety standards.

CO103504B.2	Interpret cardiovascular measurements through ECG, blood pressure systems, and smart monitoring technologies.
CO103504B.3	Differentiate neural and muscular instrumentation by evaluating EEG, EMG, and neuromodulation devices.
CO103504B.4	Assess medical imaging and digital healthcare systems using DICOM and telemedicine frameworks.
CO103504B.5	Apply respiratory instruments and digital health technologies in clinical applications.

Course Code	Signals and Systems (103504C)
CO103504B.1	Classify signals and systems based on their properties.
CO103504B.2	Determine the response of LTI systems using convolution.
CO103504B.3	Use Laplace and Z transforms to analyze continuous and discrete time systems.
CO103504B.4	Explore Fourier series representations.
CO103504B.5	Analyze signals in the frequency domain using Fourier Transform techniques.

Course Code	Engineering Measurements (170505C)
CO170505C.1	Apply the principles of engineering measurement systems, static and dynamic characteristics, calibration, and measurement techniques.
CO170505C.2	Analyze measurement data using statistical methods and evaluate measurement uncertainty and signal conditioning requirements.
CO170505C.3	Select appropriate industrial sensors for temperature, pressure, flow, level, and vibration measurement in engineering applications.
CO170505C.4	Evaluate position, motion, and MEMS-based sensors including encoders and accelerometers for modern multidisciplinary systems.
CO170505C.5	Design suitable electrical or structural measurement systems integrating sensor selection and performance considerations for real-world applications.

T.Y. B.Tech. 1033024 Course, Semester-II

Course Code	Internet of Things (103601)
CO103601.1	Explain IoT architecture, hardware platforms, and programming tools.
CO103601.2	Compare IoT connectivity technologies for different applications.
CO103601.3	Understand networking protocols used in IoT environments.
CO103601.4	Use cloud platforms for IoT data storage, monitoring, and dashboards.
CO103601.5	Identify industrial IoT, security requirements in real world applications.

Course Code	Process Instrumentation (103602)
CO103602.1	Analyse feedback control systems, evaluate set-point and disturbance responses, and apply P, I, D, PI, and PID controllers to simple processes.
CO103602.2	Apply and evaluate advanced control strategies (cascade, feedforward, ratio, split-range, selective, inferential) to enhance process performance.
CO103602.3	Investigate multivariable (MIMO) process interactions, determine variable pairing using RGA, and formulate basic decoupling solutions.
CO103602.4	Optimize thermal system performance by integrating feedback, feedforward, and cascade control in heat exchangers and boiler loops.
CO103602.5	Analyze and apply appropriate control strategies to chemical and mechanical systems to ensure stable and safe operation.

Course Code	Building Automation (103603A)
CO103603A.1	Apply BAS architecture and communication protocols in smart building scenarios.
CO103603A.2	Examine comfort parameters and sensor data to interpret indoor environmental conditions.
CO103603A.3	Investigate HVAC air systems and control strategies for optimized ventilation and performance.

CO103603A.4	Investigate HVAC water systems and energy solutions to analyze performance and efficiency in thermal management.
CO103603A.5	Illustrate modern access control, CCTV, IoT-based building security, analytics, and integrated BAS platforms.

Course Code	Robotics and Automation (103603B)
CO103603B.1	Understand robotics fundamentals and apply the same to Engineering problems.
CO103603B.2	Apply the knowledge of vectorial mathematics and geometry for kinematics (Direct and Inverse) motion.
CO103603B.3	Perform trajectory planning and work space analysis for robots.
CO103603B.4	Use image representation for robotic movement.
CO103603B.5	Analyze the applications of robots in various industries.

Course Code	Digital Signal Processing (103603E)
CO103603E.1	Explain and classify discrete-time signals and systems.
CO103603E.2	Analyze discrete-time linear systems using convolution summation, difference equation, Z-Transform and determine system stability and causality.
CO103603E.3	Evaluate discrete-time systems in frequency domain using DFT, circular convolution and FFT algorithms.
CO103603E.4	Design digital IIR filters using classical analog-to-digital transformation techniques such as impulse invariant and bilinear transformation methods.
CO103603E.5	Design linear-phase FIR filters using Fourier approximation and windowing techniques, and compare their performance with IIR filters.

Course Code	Safety Instrumented Systems (103604A)
CO103604A.1	Understand process and functional safety, hazards, risks, and the role of instrumentation in reducing risk.

CO103604A.2	Perform basic hazard analysis, HAZOP, and determine SIL using risk tools and LOPA concepts.
CO103604A.3	Describe SIS components, redundancy, voting logic, common cause failures, and maintenance requirements.
CO103604A.4	Develop simple safety PLC logic, create trip/interlock sequences, and prepare EPC safety documentation.
CO103604A.5	Apply reliability concepts, perform basic SIS calculations, and analyze mini case studies for SIL compliance.

Course Code	Process Modeling and Optimization (103604B)
CO103604B.1	Explain the principles of process modelling and identify the types of models used in process industries.
CO103604B.2	Formulate mathematical models using material, energy, and momentum balances for steady-state and dynamic systems.
CO103604B.3	Apply linear and nonlinear optimization methods to chemical and process engineering problems.
CO103604B.4	Analyze model results, perform sensitivity studies, and validate the model against real process data.
CO103604B.5	Design optimized solutions for industrial processes considering constraints, safety, and sustainability.

Course Code	Power Electronics and Drives (103604E)
CO103604E.1	Understand power semiconductor devices and power electronic converters.
CO103604E.2	Design rectifier, chopper, and inverter circuits.
CO103604E.3	Apply power electronic converters for DC and AC motor drives.
CO103604E.4	Design speed control techniques of electrical drives.
CO103604E.5	Select suitable drives for industrial applications.

Course Code	P&ID and Instrumentation Documentation (103605)
CO1	Identify and draw ISA symbols and create instrument tags.
CO2	Read and modify P&IDs for different process systems.
CO3	Create instrument indexes, datasheets, loop diagrams, and wiring documents.
CO4	Prepare hook-up drawings, cable schedules, and basic panel layouts.
CO5	Write simple control logic and develop C&E tables for alarms and trips.

Course Code	Industrial Control Components (170605A)
CO170605A.1	Understand fundamentals of industrial control systems.
CO170605A.2	Identify and use electrical control components.
CO170605A.3	Analyse working of sensors and transducers.
CO170605A.4	Explain operation of actuators and drives.
CO170605A.5	Develop basic PLC programs and control logic.

BE Semester-I

Subject Code	Process Control Techniques (406261)
C401.1	Estimate the input variables, output variables, constraints and characteristics of processes and determine control objectives.
C401.2	Derive, develop and analysis of a mathematical model using fundamental laws and by performing experiments on prototype systems.
C401.3	Design a PID controller using direct synthesis and IMC strategy for stable processes (either minimum or non-minimum phase). Tuning of PID controller using open loop process reaction curve method and closed loop ultimate cycle method.
C401.4	Design Cascade, Ratio, Feedforward, Selective, Split range and Inferential Control. Understand physical realization limitations due to time delays and RHP zeros.
C401.5	Determine the degree of interaction and proper input-output pairings that best suited for the control problem through the concept of relative gain array (RGA), and design a de-coupler controller

Subject Code	Project Engineering & Management (406262)
C402.1	Understand the role and responsibilities in the project organization team
C402.2	Use the tools of Project Planning and scheduling and planning
C402.3	Plan and prepare the documents/activities required during different phases of the project.
C402.4	Use the standards need to be used in the project development.
C402.5	Interpret the design information from the documents

Subject Code	Elective- III Wireless Sensor Networks (406263)
C403C.1	Design a wireless sensor network for given sensor data using microcontroller, transceiver, middleware and operating system.
C403C.2	Evaluate the performance of schedule based and random Medium Access Control protocols for power consumption, fairness, channel utilization and control packet overhead.
C403C.3	Evaluate the performance of Geographic routing protocols for power consumption, scalability and latency parameters.
C403C.4	Evaluate the performance of transport control protocols for congestion detection and avoidance, reliability and control packet overhead parameters.
C403C.5	Explore and implement solutions to real world problems using sensor devices, enumerating its principles of working.

Subject Code	Elective-IV Automotive Instrumentation (406264)
C404C.1	Design and implement measurements system in automobiles using various sensors and transducers.
C404C.2	Develop automated systems for safety of passengers and vehicles.
C404C.3	Implement different standards and protocols for automobile automation.
C404C.4	Identify designing required for electric vehicle charging.
C404C.5	Design and develop IoT automation for vehicle manoeuvrability and accident avoidance.

Subject Code	Virtual Instrumentation Lab (406265)
C405.1	Understanding Virtual Instrument concepts.
C405.2	Develop program for specific application using Virtual Instrument software.
C405.3	To acquire, analyze and display the throughput of any compatible system.
C405.4	Interface hardware and software using Virtual Instrument.

Subject Code	Project Stage- I (406266)
C406.1	Identify and Analyze the engineering project problems for industry and society.
C406.2	Utilize the technical knowledge and skills to outline the project work statement.
C406.3	Determine the Hardware and Software requirements to solve the project problem.

Subject Code	Audit Course-VII (406267)
C407.1	Understand the health, legal and safety related issues of society.
C407.2	Discuss the need for sustainable development and present report effectively using optimal resources at individual and group level using modern tools.
C407.3	Practice lifelong learning about the role and responsibility towards the environment and practice in life.

BE Semester-II

Subject Code	Process Instrumentation (406268)
C408.1	Explain control loops used in heat-exchanger control.
C408.2	Identify control variables in boiler and choose suitable controllers for controlling them.
C408.3	Illustrate control schemes used for top and bottom composition control in distillation column.
C408.4	Identify and Explain control loops used in Dryer and Evaporator control.
C408.5	Explain techniques used for chemical reaction control.

Subject Code	Advanced Embedded System (406269)
C409.1	Independently design and implement an advanced embedded system based on an 16/32-bit microcontroller.
C409.2	Develop software and hardware for embedded systems using ARM microcontroller.
C409.3	Design, structure and realize microcontroller systems with ARM
C409.4	Identify the functionality of development boards to implement ARM embedded applications.
C409.5	Design and develop real time ARM embedded systems used in industry.

Subject Code	Elective-V, Renewable Energy Systems (406270)
C410C.1	Understand the concept of distributed generation with renewable energy sources and know its main types

C410C.2	Know the operation and comparative analysis of different concentrating solar power systems.
C410C.3	Describe the complexities of energy systems and power grids, and the requirements and industrial impacts of integration, automation and optimization
C410C.4	Calculate the major parameters of sun movement, solar radiation, and tracking systems
C410C.5	Analyse the types of algorithms and understanding and familiarity with engineering and financial aspects of projects
C410C.6	Understand major concepts of wind energy. Calculate air parameters at different conditions, impact of installation height, wind power and average wind power
C410C.7	Design in order implement and improve a component, process, or integrated system of people, materials, information, equipment, and energy to meet desired needs within realistic constraints

Subject Code	Elective-VI, Environmental Instrumentation (406271)
C411C.1	Design instrumentation systems for environment monitoring.
C41CA.2	Develop methodology for waste water treatment.
C411C.3	Measure and analyse air quality and other parameters.
C411C.4	Measure and analyse water quality.
C411C.5	Provide solution to reduce pollution

Subject Code	Project Stage –II (406272)
C412.1	Organize and build the project within time and financial resources.
C412.2	Test and verify the implemented solution for the selected project problem.
C412.3	Demonstrate and document the project work.

Subject Code	Audit Course (406273)
C413.1	Understand the health, legal and safety related issues of society.
C413.2	Discuss the need for sustainable development and present report effectively using optimal resources at individual and group level using modern tools.
C413.3	Practice lifelong learning about the role and responsibility towards the environment and practice in life.