



NASHIK DISTRICT MARATHA VIDYA PRASARAK SAMAJ'S
Karmaveer Adv. Baburao Ganpatrao Thakare
College of Engineering

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Instrumentation & Control
Engineering Department
Course Outcomes

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

1. Core competency in the multidisciplinary field of automation to cater to the industry and research needs.
2. Multi-disciplinary skills, team spirit and leadership qualities with professional ethics, to excel in professional career and/or higher studies in Instrumentation and Control Engineering.
3. Prepared to learn and apply contemporary technologies for addressing impending challenges for the benefit of organization/society.

Program Outcomes

PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	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.
PO4	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.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	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.
PO7	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.
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	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.
PO11	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.
PO12	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

Program Specific Outcomes

PSO 1	Students will have a strong foundation in mathematical, scientific & engineering fundamentals necessary to formulate, solve & analyze complex instrumentation problems.
PSO 2	Apply instrumentation & control in multidisciplinary domains related to research & entrepreneurship development. (Domains: Process, Biomedical, Environment, Power generation etc.)
PSO 3	Communicate effectively to work as a team with professional ethics for the benefit for society.

SE Subject Course Outcomes
ACADEMIC YEAR:-2019-19
Semester-I

Subject Code	Engineering Mathematics-III (207006)
C201.1	Solve higher order linear differential equation using appropriate techniques for modeling and analysing electrical circuits.
C201.2	Solve problems related to Laplace transform and applications to Signal processing and Control systems.
C201.3	Solve problems related to Fourier transform, Z -Transform and applications to Signal processing and Control systems.
C201.4	Perform vector differentiation and use it to solve vector Identities.
C201.5	Apply Vector Integration to Compute line, surface and volume integrals.
C201.6	Analyze conformal mappings, transformations and perform contour integration of complex functions in the study of electrostatics and signal processing.

Subject Code	Sensors & Transducers- I (206261)
C202.1	Demonstrate an understanding of basics of sensors and transducers for Instrumentation and Control Engineering
C202.2	Elaborate different concepts & principles of displacement sensors.
C202.3	Select suitable sensor for Velocity, Speed, Vibration and Acceleration applications
C202.4	Understanding importance of force and pressure transducers applications.
C202.5	An ability to suggest the suitable temperature measurement technique.
C202.6	Ability to design and conduct experiments for measurement.

Subject Code	Basic Instrumentation (206262)
C203.1	Apply the fundamentals of instrumentation to perform electrical measurements and calibration.
C203.2	Select and use proper instrument with appropriate characteristics and range extension for given application.
C203.3	Select and use appropriate bridge for various applications.
C203.4	Use Analog Oscilloscope, Digital Storage Oscilloscope for different parametric measurements.
C203.5	Compare digital instruments with analog instruments. Use different digital instruments and express their accuracies.
C203.6	Make use of recorders and function generators, learn the basics of Virtual Instrumentation.

Subject Code	Linear Integrated Circuits (206263)
C204.1	Students will be able to illustrate characteristics, discuss their significance in selection of operational amplifier (PO2 and PO5), also compare open & closed loop configuration.
C204.2	Students will be able to design and implement closed loop configurations of op-amp (PO1).
C204.3	Students will be able formulate simple problems for sensors using linear circuits (AD620), communicate effectively and understand importance of lifelong learning. (PO10, PO12).
C204.4	Students will be able to design and analyze non-linear applications.
C204.5	Students will be able to design and develop timers and linear voltage regulator.
C204.6	Students will be able to design and develop active filter.

Subject Code	Network Theory (206264)
C205.1	Apply various network analysis methods (Mesh, node, differential equation with Initial Conditions).
C205.2	Use network theorems for simplification and analysis of circuit.
C205.3	Determine network functions and analyze stability by pole - zero identification.
C205.4	Analyze two port networks (Z, Y, H, ABCD parameters).
C205.5	Realize one port network using positive real functions and carry out network synthesis.
C205.6	Understand the importance of filters and attenuators for transmission lines.

Subject Code	Programming Languages (206265)
C206.1	Write a C Program for small applications.
C206.2	Apply proper searching and sorting methods for a given application.
C206.3	Implement the operation of stack and queue using arrays.
C206.4	Construct and test C program for matrix operations.
C206.5	Apply appropriate techniques using C language for solving the computing problems (polynomial addition and data base management).
C206.6	Will be able to write simple program in graphics.

SE Subject Course Outcomes
ACADEMIC YEAR:-2019-19
Semester-II

Subject Code	Sensors & Transducers- II (206267)
C208.1	Select and Use different flow measuring sensors and transducers for volumetric and mass flow measurement.
C208.2	Use the various level measurement techniques.
C208.3	Carry out measurement of viscosity and density of various materials.
C208.4	Identify and use appropriate miscellaneous sensor for certain applications.
C208.5	Select the signal conditioning device for a particular transducer.
C208.6	Design and implement the signal conditioning circuit for given parameter.

Subject Code	Automatic Control Systems (206268)
C209.1	Classify the control systems.
C209.2	Develop mathematical models of control systems.
C209.3	Analyze the Linear time invariant system in time and frequency domain.
C209.4	Get familiar with modern control theory.

Subject Code	Electronic Instrumentation (206269)
C210.1	Students will be able to analyze the operation of different types of measuring instruments like True-RMS Meter, DMM, RLC-Q meter, Distortion Factor Meter, Universal Counter and know the working of measuring instruments.
C210.2	Students will be to analyze the operation of different types of signal generating instruments like Arbitrary Waveform Generator, Ramp wave Generator, Pulse Generator. Know the working of signal generating instruments.
C210.3	Students will be able to know the complete internal structure of ADCs and DACs. Perform the experiments, analysis on ADC and DAC ICs.
C210.4	In the LCR circuit student can determine experimentally the unknown inductance, capacitance and resistance and Q and D factor with the instruments with which he can know the different options and strengths of the instruments.
C210.5	Further to know the knowledge in the field of integrated circuit technology and its applications like PLL, VCO, Analog MUX/DEMUX, VTF and FTV.
C210.6	Students can understand and Analyze the types of modulations, Demonstrate about various blocks in Transmitters and Receivers, Analyze all Modulation techniques in time and frequency domains.
C210.7	An ability to built, implement software programming using Labview to solve engineering problems.

Subject Code	Digital Techniques (206270)
C211.1	Represent numerical values in various number systems and perform number conversions between different number systems
C211.2	To reduce the digital circuits by using Boolean algebra, K-maps and Tabulation Method. Also can interface the different components from different logic families.
C211.3	Design and implement the combinational circuits (Adder, Subtractor, decoders, encoders, multiplexers, and de-multiplexers).
C211.4	Understand basic concepts of flip-flops, registers and counters.
C211.5	Design, implement and analyze sequential circuits using flip-flops, registers and counters.
C211.6	Summarize memory devices: ROM, RAM, PROM, PLD, FPGAs. Also can design a simple application of digital system.

Subject Code	Industrial Drives (206271)
C212.1	The students will be able to use different power electronics devices in various applications.
C212.2	Students will learn classifications and working principles of converters, choppers and inverters along with drawing input/output waveforms.
C212.3	The students will be able to select DC motors for different applications.
C212.4	The students will be able to select single phase AC motors for different applications.
C212.5	The students will be able to discuss suitable techniques for controlling various DC motors.
C212.6	The students will be able to discuss suitable techniques for controlling various single phase AC motors.

Subject Code	Soft Skills (206271)
C213.1	Student will be able to apply Strength Weakness Opportunities and Threats (SWOT) analysis & set their own goals.
C213.2	Confidently speak and present their work in front of masses. Also can effectively write letters, applications and reports.
C213.3	Listening discussions interpret the subject and write minutes of meeting.
C213.4	Participate in group discussion and prepare their resume.
C213.5	Effectively manage work stress.
C213.6	Work in a team with good leadership qualities.

Subject Code	Drives Control Laboratory (206273)
C214.1	The students will be able to make use of MATLAB M file programming and MATLAB SIMULINK software.
C214.2	Students will be able to analyze the transient responses of transfer function of different systems.
C214.3	Students will be able to analyze the stability of system using root locus and bode plot methods.
C214.4	Students will be able to plot the characteristics of SCR
C214.5	Students will be able to use UJT/DIAC for triggering SCR/TRIAC
C214.6	To study and implement the controlled rectifier circuits.

TE Subject Course Outcomes
ACADEMIC YEAR:-2019-19
Semester-I

Subject Code	Embedded System Design (306261)
C301.1	Acquire knowledge about microcontrollers, embedded Systems and their applications. Summarize the difference between microcontroller and microprocessor. Foster ability to understand the internal architecture of 8051 microcontroller along with programming 8051.
C301.2	Discuss the basic functions of timer counters and interrupts in human life. Understand the function of timer counter and interrupt blocks in 8051 microcontroller.
C301.3	Understand the interfacing of 8051 Microcontrollers with different peripheral devices like LED Displays, LCD displays, Keyboards, DAC & ADC.
C301.4	Able to interface 8051 Microcontrollers with Real world devices like Sensors, Stepper motor, Relays, RTC, Serial ADC and Serial EEPROM. Give examples to understand the role of embedded systems in industry.
C301.5	To understand the architectural details of AVR microcontroller. Summarize the comparison of AVR microcontroller and 8051 microcontroller. In association with instruction set foster ability to write the programs for AVR microcontroller.
C301.6	Discuss the different blocks like Timer/counter, UART & ADC of AVR microcontroller.

Subject Code	Instrumental Methods for Chemical Analysis (306262)
C302.1	Understand the basic concepts & methods for different chemical analysis.
C302.2	To understand working of all types of spectrometers & select appropriately.
C302.3	Perform quantitative & qualitative analysis of different samples by using photometer& spectrometer.
C302.4	To understand the working of different types of analysers, NMR, Fluorimeter & Phosphorimeter& select appropriate analyser for industrial applications.
C302.5	Analyse various samples using chromatography& mass spectrometer.
C302.6	Recognize application areas of different radioactive instruments.

Subject Code	Control System Components (306263)
C303.1	Use various switchgears for industrial applications.
C303.2	Develop electrical circuits for motor operation.
C303.3	Design, develop and demonstrate pneumatic circuits for the given application using appropriate pneumatic components
C303.4	Design, develop and demonstrate hydraulic circuit for the given application using appropriate hydraulic components. Also they can compare pneumatic, hydraulic and electrical systems.
C303.5	Understand various auxiliary components and select them for particular application.
C303.6	Classify the hazardous area and materials as per NEC standards. Also can design for intrinsic safety.

Subject Code	Control System Design (306264)
C304.1	Analyze the system in time and frequency domain.
C304.2	Design the compensator for required specifications using classical mathematical tools.
C304.3	Apply the classical approach to Tune the PID controllers.
C304.4	Design the controllers using direct synthesis approach.
C304.5	Design the state feedback controllers and observers.
C304.6	Analyze the controller performance using performance indices.

Subject Code	Industrial Organisation and Management (306265)
C305.1	Apply the different management tools in engineering business organizations.
C305.2	Use the quality and environmental standards.
C305.3	Decide outsourcing works, use Production Planning Control techniques, work in stores and purchase department.
C305.4	Apply the knowledge of Human Resource Management for multidisciplinary environments.
C305.5	Utilize the knowledge of financial management in their life and at professional workplace.
C305.6	Apply ethical principles using, morals and effective utilization of Information Technology in different contexts.

Subject Code	Numerical Methods (306266)
C306.1	Apply range of mathematical and technical concepts to applications.
C306.2	Methods to learn control engineering.
C306.3	Able to find numerical solution.
C306.4	Able to solve numerical methods using software (C/Matlab).
C306.5	Able to develop the algorithm to implement mathematical solutions of any Problem

TE Subject Course Outcomes
ACADEMIC YEAR:-2019-19
Semester-II

Subject Code	Digital Signal Processing (306268)
C308.1	Classify and compare the basic signals and systems, DSP and ASP
C308.2	Apply the Z-transform for analysis of discrete time systems.
C308.3	Calculate the magnitude and phase response of the given discrete time system.
C308.4	Utilize FFT/IFFT algorithms for determination of DFT.
C308.5	Design IIR filters to meet frequency domain specifications.
C308.6	Implement FIR filters to meet frequency domain specifications.

Subject Code	Process Loop Components (306269)
C309.1	Students will be able to recognize process variables and state types of transmitters.
C309.2	Students will be able to compute process characteristics and control system parameters
C309.3	Students will be able to apply tuning algorithm to control system.
C309.4	Students will be able to analyze Programmable Logic Controllers and create ladder diagrams.
C309.5	Students will be able to compare control valve characteristics and selection of valves.
C309.6	Students will be able formulate a problem to find control valve sizing for given process conditions.

Subject Code	Unit Operations & Power Plant Instrumentation (306270)
C310.1	Understand the unit operations used in process industries and discuss their various applications.
C310.2	Able to write mathematical equations of operations related to heat and mass transfer.
C310.3	Able to understand the various renewable and non-renewable methods of power generation and its statistics in India.
C310.4	Learn the power generation method of thermal power plant and discuss the instrumentation related to the boiler (safety interlocks).
C310.5	To remember the start-up and shut down procedure of boiler. Will be able to understand the parameters to be controlled in boiler thereby increasing its efficiency.
C310.6	Understand the unit operations used in process industries and discuss their various applications.

Subject Code	Instrument and System Design (306271)
C311.1	Understand basic concepts of system design with the use of NEMA / IP standards for enclosure design.
C311.2	Use the concepts of interferences (EMI, ESD), interpret their effects, and apply minimization ways in system design.
C311.3	Select and utilize appropriate single chip device for analog system design.
C311.4	Select and utilize appropriate single chip device for digital system design.
C311.5	To design PCB, mount components and test the board for a system.
C311.6	Evaluate the reliability and quality of product. Also prepare various documents related with system design.

Subject Code	Bio- Medical Instrumentation (306272)
C312.1	Select & use various biosensors for measurement of physiological parameters.
C312.2	Able to measure & analyse the different ECG patterns with the demonstration of its signal processing
C312.3	Compare Invasive and Non-invasive methods for the cardiovascular measurements.
C312.4	Demonstrate & Analyse different brain & muscle signals with its interpretations.
C312.5	Detect and analyse hearing and vision losses.
C312.6	Understand the natural breathing system and demonstrate the uses of artificial system.

Subject Code	Mini Project (306273)
C313.1	Planning and implementation of hardware/ software project.
C313.2	Prepare the budget for hardware requirement.
C313.3	Demonstrate the project.
C313.4	Work as a team member.

BE Subject Course Outcomes
ACADEMIC YEAR:-2019-19
Semester-I

Subject Code	Process Dynamics & Control (406261)
C401.1	Ability to understand the basic principles & importance of process control.
C401.2	An ability to formulate experimental model and analysis of process loops.
C401.3	Design, development and performance evaluation of feedback control loops.
C401.4	Apply knowledge of various process control strategies for multi-loop systems.
C401.5	An ability to make use of decoupling control for multivariable control systems.
C401.6	Ability to define a problem and solve process control assignments.

Subject Code	Project Engineering & Management (406262)
C402.1	To define objectives of project management and apply it for small projects.
C402.2	To apply project management skills for better planning, execution and monitoring.
C402.3	To analyse Project engineering documents and drawing.
C402.4	To apply knowledge of project detail engineering (like GA, BOM and MBOM, Cable engineering and cable selection) for various applications.
C402.5	To execute the procurement and construction activities.
C402.6	To design control rooms layouts, engineering control panel for a project.

Subject Code	Computer Techniques & Application (406263)
C403.1	To explain the operating system functions in detail.
C403.2	To differentiate real time operating system and operating system.
C403.3	To evaluate the performance of any developed software.
C403.4	To use the proper communication channel and software for transforming and storing the data

Subject Code	Electrical Drives (Elective- I) (406264)
C404-A.1	Differentiate between the old and new speed control techniques for drive.
C404-A.2	Analyze and select drive based on load torque and speed characteristics
C404-A.3	Explain working of various converters used in drive system
C404-A.4	Select a DC drive for given application.
C404-A.5	Demonstrate working and select AC drive for given application
C404-A.6	Understand the concept of servo and traction drive.

Subject Code	Automotive Instrumentation (Elective- II) (406265)
C405-B.1	Understand & List different type of automotive instrumentation systems (electronic engine management, electronic dashboard, onboard diagnostic, security and warning).
C405-B.2	Analyze the working and performance parameters of batteries. Also can explain the starting system for automobile.
C405-B.3	Explain the fundamentals of fuel Injection and Ignition control system.
C405-B.4	Discuss the functioning of variousSensors & Actuators.
C405-B.5	Compare the current developments in generation of DC current and its utilization.
C405-B.6	Acquire knowledge of various automotive safety and comfort systems. Also can discuss on emission systems and its updated norms.

Subject Code	Project Stage- I (406266)
C406.1	Identify and analyze the problem.
C406.2	Formulate the problem statement by applying the technical knowledge and skills.
C406.3	Design hardware and software to solve the identified problems.
C406.4	Utilize the team work to solve problems and make proper decisions.
C406.5	Develop an optimized solution for problem within available resources and time.
C406.6	Enhance the technical as well as non-technical skills (writing, communication)

BE Subject Course Outcomes
ACADEMIC YEAR:-2019-19
Semester-II

Subject Code	Process Instrumentation (406268)
C408.1	Apply & Analyze different instrumentation approaches (feedback, feedforward & cascade) to heat exchanger and Design PID controllers for heat exchangers
C408.2	Understands safety interlocks, burner management system (BMS) & optimization of efficiency in boiler, Classify manipulated & controlled variables, Apply & Analyze controls by approaches (Ratio, selective & split-range) and Design controllers for industrial boilers
C408.3	Apply and Analyze instrumentation & controls to distillation column. (flow control, top & bottom composition, reflux ratio & pressure control)
C408.4	Classify dryers & evaporators, Apply & Analyze instrumentation and control by using feedback, feedforward and cascade strategies.
C408.5	Understands basic factors governing conduct of reaction, stability, time constant and effect of lag, types of reactors (continuous & batch) and Apply & Analyze different controls (flow, temperature, pH, sequential & logic) to types of reactor.
C408.6	Ability classify pumps & compressors and Apply basic controls to pumps & compressors.

Subject Code	Industrial Automation (406269)
C409.1	Understand and differentiate various automation tools w.r.t. their performance criteria.
C409.2	Study and select various instrumentation protocols as per requirement.
C409.3	Design, develop and demonstrate a PLC programme using software.
C409.4	Design, develop and demonstrate a PLC & SCADA interface application.
C409.5	Understand, compare various DCS functions w.r.t PLC.
C409.6	Develop a HaZop and SIL document for a process.

Subject Code	Robotics and Automation (Elective- III) (406270)
C410.1	The students will be able to identify and describe the classification of robot manipulators and will be able to list manufacturers of robot.
C410.2	The students will be able to elaborate various characteristics of manipulator arms.
C410.3	The students will be able to describe various applications of machine vision in robots and will be able to select controller for machine vision.
C410.4	Students will be able to analyze the robot dynamics and present industrial robot control schemes.
C410.5	Students will be able to compare challenges in robot programming and discuss Robot-PLC interfacing.
C410.6	Students will be able to recognize importance of case studies and will be able to select suitable robot for particular application.

Subject Code	Smart Material and Systems (Elective- IV) (406271)
C411.1	Discuss commonly used materials, their structures, distribution types and properties (hysteresis, poling, modulus, temperature effect, external interference) for smart sensors.
C411.2	Discuss on different material categories and their applications.
C411.3	Students will be able to list and discuss latest applications of ionic, magnetic and other smart materials. Students will be motivated to imagine use of such materials in sensors.
C411.4	Students will be able to select Sensors and actuators for smart systems.
C411.5	Students will be able to understand Micro Electro Mechanical Sensors manufacturing techniques.
C411.6	Students will be able to correlate and identify applications of smart systems for industrial and societal problems.

Subject Code	Project Stage –II (406272)
C412.1	Identify and analyze the problem.
C412.2	Formulate the problem statement by applying the technical knowledge and skills.
C412.3	Design hardware and software to solve the identified problems.
C412.4	Utilize the team work to solve problems and make proper decisions.
C412.5	Develop an optimized solution for problem within available resources and time.
C412.6	Enhance the technical as well as non-technical skills (writing, communication)

Subject Code	Online Certification Course (406273)
C413.1	Analyze various online courses offered by MHRD, Government of India and / or other Research Institutes.
C413.2	Select courses based on their interests and course's relevance to their engineering program.
C413.3	Enroll and access courses on MOOCs.
C413.4	Meet the assessment criteria set by the Research Institute or as decided by the Institutional Coordinator for this course.