

Vidyavardhini's college of Engineering & Technology Vasai(W)
Department of Instrumentation Engineering
R-2012

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 teamwork: 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	
At the end of the program engineering graduate will be able to:	
PSO1:	electronics, measurements and control to work as a successful professional in
PSO2:	Demonstrate professional ethics and standards, effective communication skills and team work to solve real-world problems.

Course Outcomes	
	At the end of the semester student will able to
FEC101	Applied Mathematics I
FEC101.1	Apply the concepts of Complex Numbers,hyperbolic functions and logarithms to solve engineering problems.
FEC101.2	Solve and Analyze Partial Derivatives and apply it in related field of Engineering.
FEC101.3	Apply principals of basic operations of matrices , rank and echelon form of matrices to solve linear simultaneous equations & Curve Fitting.
FEC101.4	Apply Numerical Methods and Inculcate the habit of Mathematical thinking through Indeterminate forms, Taylor's Series Expansion and by using Scilab.
FEC102	Applied Physics I
FEC102.1	Students will be able Draw miller indices using concept of crystallography and Identify crystal structure using X-ray diffraction techniques viz. Laue method, rotating crystal method & powder method.
FEC102.2	Students will be able Determine the output of LED, photoconductor and photovoltaic
FEC102.3	Students will be able Classify dia,Para and Ferro magnetic material based on susceptibility value using qualitative treatment of Langvein and Weiss equation
FEC102.4	Students will be able Design acoustic of hall/auditorium using reasons for acoustic defects and Select method for production of ultrasonic waves.
FEC103	Applied Chemistry I
FEC103.1	Students will be able Analyze the quality of water and suggest methods of treatment.
FEC103.2	Students will be able Illustrate the knowledge of polymers, fabrication methods, conducting polymers in industrial fields.
FEC103.3	Students will be able Apply the knowledge of lubricants, their properties & mechanism to avoid frictional resistance and interpret phase transformations using thermodynamics
FEC103.4	Students will be able Demonstrate knowledge of portland cement.
FEC104	Engineering Mechanics
FEC104.1	Students will be able to Illustrate the concept of resultant for different types of force systems and locate the centroid for plane composite lamina.
FEC104.2	Students will be able to Analyse the support reactions, trusses and real life application of friction by using conditions of equilibrium.
FEC104.3	Students will be able to Analyse the motion of particles and rigid bodies by establishing the kinematic relation between displacemnt, velocity and acceleration.
FEC104.4	Students will be able to Analyse body in motion using force and acceleration, work-energy, impulse- momentum principles.

FEC105	Basic Electrical & Electronics Engineering
FEC105.1	Students will be able to understand fundamentals of DC circuits and apply knowledge for analyzing network theorems in DC circuits.
FEC105.2	Students will be able to learn the fundamentals and analyze single phase AC circuits and three phase AC circuits.
FEC105.3	Students will be able to learn the basic operation and analyze the performance of single-phase transformer.
FEC105.4	Students will be able to Illustrate the concepts of semiconductor devices diode,BJT and its applications(Rectifier,filter).
FEC106	Environmental Studies
FEC106.1	Classify essential resources and control measures for sustainable development.
FEC106.2	Illustrate sources and effects of environmental decay.
FEC106.3	Select renewable sources of energy and technology essential for sustainable development.
FEC106.4	Apply the regulations of Environmental Protection Act and other bodies for perpetuation of environment.
FEL101	Basic Workshop practice-I
FEL101.1	Model different prototypes in the carpentry trade such as Cross cut lap joint, Tee lap joint, Dovetail lap joint.
FEL101.2	Model various basic prototypes in the trade of fitting such as Square, Hexagonal and V Male Female joint.
FEL101.3	Perform various basic House Wiring techniques while taking care of electrical safety.
FEL101.4	Perform various basic domestic plumbing operations such as pipe cutting, threading, fitting etc.
FEC201	Applied Mathematics II
FEC201.1	Students will be able to apply euler, runge kutta method to solve differential equations of second and fourth order and apply trapezoidal, simpson's $\frac{1}{3}$ rd, simpson's $\frac{3}{8}$ th rule to solve definite integrals numerically and by using scilab.
FEC201.2	Students will be able to Solve differential equations of first order, first degree and engineering problems representable in form of linear differential equations with constant coefficients, Cauchy's/Legendre's homogenous equations
FEC201.3	Students will be able to Apply Beta, Gamma functions and D.U.I.S.to evaluate definite integrals.
FEC201.4	Students will be able to apply double /triple integration to find area, mass, volume and find length of the curve using scilab and rectification method.
FEC202	Applied Physics II
FEC202.1	Students will be able to Calculate thickness of thin wire or foil to wedge-shaped thin film, refractive index, wavelength of light /or radius of curvature to Newton's rings in
FEC202.2	Students will be able to Calculate critical angle, angle of acceptance, V number, number of modes of propagation, numerical aperture of step index fibre and compare characteristics of images received by photography and holography
FEC202.3	Students will be able to determine non-existence of electrons in the nucleus using uncertainty principle and calculate motion of free particle using time independent and time dependent Schrodinger wave equation.

FEC202.4	Students will be able to Apply concept of electromagnetism in focussing system and CRO
FEC203	Applied Chemistry II
FEC203.1	Students will be able to Illustrate types of corrosion & suggest control measures in industries.
FEC203.2	Students will be able to Analyze the quality of fuel & calculate the oxygen required for combustion of fuel.
FEC203.3	Students will be able to Illustrate composition, properties of alloys & properties & application of composite material.
FEC203.4	Students will be able to Illustrate the principles of green chemistry.
FEC204	Engineering Drawing
FEC204.1	Students will be able Apply the basic principles of projections in Projection of Lines, Planes and Engineering Curves.
FEC204.2	Students will be able Apply the basic principles of projections in Projection of Solids & Section of solids
FEC204.3	Students will be able Visualize the given 3D object and draw Orthographic projections
FEC204.4	Students will be able Draw Isometric view from the given orthographic projections
FEC204.5	Students will be able Draw Orthographic and Isometric Projection using AutoCad
FEC205	Structured Programming Approach
FEC205.1	Students will be able to write an algorithm to support Structure Programming approach.
FEC205.2	Students will be able to use variables, derived data types and control structures to write C program
FEC205.3	Students will be able to use Strings and Functions to solve complex computational problem
FEC205.4	Students will be able to use Pointers, Structure-Union and Files for solving complex computational problem
FEC206	Communication Skills
FEC206.1	Students will be able to develop the ability to understand the importance of communication fundamentals.
FEC206.2	Students will be able to apply techniques to improve oral communication & develop their own speaking style.
FEC206.3	Students will be able to acquire the letter writing skills and produce the letters in any given situation.
FEC206.4	Students will be able to learn all the important aspects of reading including skimming, scanning , note making and understand discourse coherence.
FEL201	Basic Workshop practice-II
FEL201.1	Students will be able to Model different prototypes in the carpentry trade such as Cross cut lap joint, Tee lap joint, Dovetel lap joint.
FEL201.2	Students will be able to Model various basic prototypes in the trade of fitting such as Square, Hexagonal and V Male Female joint.
FEL201.3	Students will be able to Read various basic Layout drawing; make positive and negative film, and perform PCB etching and drilling, Tinning and soldering operations.

FEL201.4	Students will be able to Dismantle and Assemble a Personal Computer, perform Basic troubleshooting and maintenance, identify network components and perform Basic networking and crimping.
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ISC301	Applied Mathematics III
ISC301	Apply the concept of fourier series in the field of Control system, Biomedical Instrumentation and Image Processing.
ISC301	Apply Laplace transform, inverse Laplace transform in linear time invariant systems to define the transfer function of a system.
ISC301	Apply principles of vector differentiation, integral calculus and Bessel function in control theory and electromagnetism.
ISC301	Apply Cauchy Reiman equation, Harmonic function, Conformal mapping, Bilinear transformations for designing control systems for given process.
ISC302	Electrical Network Analysis and Synthesis
ISC302.1	Analyze circuits with DC and AC sources using KVL and KCL.
ISC302.2	Analyze circuits with DC and AC sources using Thevenin's, Norton's, Maximum power transfer, superposition theorem and Coupled coils.
ISC302.3	Analyze Two port Networks, Network functions, Transient and Steady State responses of passive electrical networks.
ISC302.4	Analyze Graph theory and network synthesis
ISC303	Analog Electronics
ISC303.1	analyze pn junction Diode and Zener diode circuits with d.c. supply.
ISC303.2	analyze BJT and JFET Circuits with d.c. supply.
ISC303.3	Design linear and nonlinear circuits using operational amplifiers.
ISC303.4	Compare class A, B, AB power amplifiers and analyze series voltage regulated power supply.
ISC304	Digital Electronics
ISC304.1	Compute addition, subtraction and multiplication on binary, octal and hexadecimal number system
ISC304.2	Design and implement computational logic circuits by using boolean laws-MAP and Quine-Mc-luskey reduction technique up to 4 variable
ISC304.3	Design sequential / non sequential logic circuit by using flip-flop up to 4 variable
ISC304.4	Compare RAM, ROM, DDR, NVRAM, bubble memory and PMOS, NMOS, CMOS, E2CMOS logic families
ISC305	Transducers - I
ISC305.1	Determine the characteristics and calculate errors of measurement systems, select measuring instrument for an application and classify methods of measurement
ISC305.2	Select appropriate displacement transducer for a given application
ISC305.3	Select appropriate temperature transducer for a given application
ISC305.4	Select appropriate level, position, velocity, acceleration, vibration, sound, humidity and moisture transducer for a given application
ISC306	Object Oriented Programming and Methodology

ISC306.1	Apply Object Oriented Programming principles and implement program using control structures and recursion
ISC306.2	Implement the concept of Class, Object & Method
ISC306.3	Implement program on inheritance, interface, packages and multi-threading
ISC306.4	Implement run-time program using Applet
ISC401	Applied Mathematics IV
ISC401.1	Calculate rank of matrix, characteristic equation, characteristic roots and use the applicability of Cayley Hamilton Theorem to find inverse of matrix which is very important in the application involving controller design.
ISC401.2	Apply Calculus of variation methods to find optimal solutions to engineering problems.
ISC401.3	Apply Complex Integration and Cauchy's Residue theorem for designing control systems for given process.
ISC401.4	Apply the concept of vector spaces and orthogonalization process in state space control theory.
ISC402	Feedback Control Systems
ISC402.1	Analyze first and second order mathematical model for electrical and mechanical systems.
ISC402.2	Derive transfer function for given SFG and Block diagram of LTI systems.
ISC402.3	Test time domain specifications for first and second order LTI system.
ISC402.4	Analyze LTI systems in time domain using Root locus and frequency domain using polar plot, Nyquist plot and Bode plot.
ISC403	Electrical Technology and Instruments
ISC403.1	Analyze the characteristics of series, shunt, compound d.c motor and derive voltage/current -speed relations for speed control methods.
ISC403.2	Analyze the characteristics with speed control circuits of induction motor and derive speed equation for fraction HP motor.
ISC403.3	Select appropriate analog meters for measurement of voltage, current, resistance, power factor, energy, phase and frequency.
ISC403.4	Derive balance equations for AC DC bridges and analyze A/D, D/A conversion circuits
ISC404	Communication System
ISC404.1	Analyze components of communication systems and select communication mode between transmitter, receiver.
ISC404.2	Compare analog communication systems on the basis of bandwidth, power requirement and the performance in the presence of noise.
ISC404.3	Compare Pulse / Digital communication systems on the basis of spectrum, bandwidth efficiency, power efficiency, probability of error and applications.
ISC404.4	Compare current, voltage and frequency telemetry systems.
ISC405	Transducers - II
ISC405.1	Select appropriate Strain measurement transducer for a given application.
ISC405.2	Select appropriate Pressure and Vacuum measurement transducer for a given application.
ISC405.3	Select appropriate Flow measurement transducer for a given application.

ISC405.4	Select appropriate pH, Conductivity, Force, Power, Torque and Density measurement transducer for a given application.
ISC406	Application Software Practices
ISC406.1	Design logical operations using Virtual Instrument (VI) and Sub VI.
ISC406.2	Build VIs using one or more than one structures such as Case structure, formula node, for and while loop, shift registers, feedback node, etc.
ISC406.3	Construct VIs involving arrays, clusters, strings, local and global variables and sequence structures.
ISC406.4	Develop VIs to display real-time data on charts / graphs or read and write data to various files by examining VISA programming and hardware interfacing via data acquisition card or simulated software module.

ISC501	Signals and Systems
ISC501.1	Implement mathematical operations on CT/DT signals and sketch the result, Classify signals and systems
ISC501.2	Apply Auto/Cross correlation and Linear/ Circular Convolution of CT/DT signals
ISC501.3	Analyse CT/DT signal in Fourier domain and relate Fourier Transform with Laplace Transform and Z Transform
ISC501.4	Analyse CT/DT signals using Laplace and Z Transform.
ISC502	Applications of Microcontroller - I
ISC502.1	Compare microprocessors & microcontrollers on the basis of embedded system technology.
ISC502.2	Develop software programs using programming tools for integrated hardware
ISC502.3	Interface peripheral components with MCS-51 using serial communication protocols.
ISC502.4	Analyze Case Studies of applications based on MCS-51
ISC503	Control System Design
ISC503.1	Examine state space model of electrical circuits, mechanical systems with emphasis on LTI systems.
ISC503.2	Design controller and observer to estimate improvement in performance specifications.
ISC503.3	Design Lead, Lag and Lag-Lead compensator using Frequency and Time domain methods to estimate improvement in performance specifications.
ISC503.4	Design and estimate PID parameters using Ziegler Nicholas and Cohen-Coon tuning methods.
ISC504	Signal Conditioning Circuit Design
ISC504.1	Analyze analog and digital signal conditioning circuits.
ISC504.2	Design signal conditioning circuits for thermal and pressure transducers.
ISC504.3	Design signal conditioning circuits for optical transducer, Potentiometer, LVDT, strain gauges, piezoelectric and capacitive type transducer
ISC504.4	Design a power supply using 78xx/ 79xx series and 723, 317 adjustable voltage IC regulator.
ISC505	Control System Components
ISC505.1	Analyze pneumatic and hydraulic circuits. Design pneumatic circuits for a given application.

ISC505.2	Select appropriate transmitter for a given application.
ISC505.3	application
ISC505.4	Choose auxiliary components depending upon the process requirement
ISC506	Bussiness Communication and Ethics
	Develop the interpersonal skills to progress professionally by building stronger relationships
ISC506.1	
ISC506.2	Design a technical document using precise language, suitable vocabulary and apt style
ISC506.3	Apply the techniques to participate in GD, Interviews and write Resume
ISC506.4	Display competence required for professional career growth
ISC601	Process Instrumentation Systems
	Identify the dynamic characteristics of a process and determine the response of discrete/continuous mode of controllers
ISC601.1	
ISC601.2	Analyze hydraulic, pneumatic controller circuits, Implement electronic controllers and tune a controller in a process loop using Cohen-Coon/Zigler-Nicholas method
ISC601.3	Apply appropriate control schemes on a process and calculate the interaction in a multivariable systems
ISC601.4	Develop the physical ladder logic diagram for a given process
ISC602	Power Electronics and Drives
	Compare power diodes, power BJT, power MOSFET, IGBT and SCR on the basis of construction, characteristics, ratings & applications.
ISC602.1	
ISC602.2	Design SCR/TRIAC based AC power control circuits with UJT/DIAC as a triggering device.
	Analyze PWM inverter, bridge inverter IGBT/ power MOSFET based inverter circuits as well as conduction modes of Buck, Boost, Buck-Boost and Cuk converter.
ISC602.3	
ISC602.4	Choose AC/DC Drives for the applications involving AC/DC motors and analyze induction & dielectric heating processes.
ISC603	Digital Signal Processing
	Compute Auto/ cross correlation and Linear/ Circular Convolution of digital signal ,realize digital filter and verify sampling theorem
ISC603.1	
ISC603.2	Perform DFT & FFT on digital signal.
ISC603.3	Design FIR and IIR filters for given specification.
ISC603.4	Analyze case studies of applications based on of DSP processor
ISC604	Applications of Microcontroller - II
	Identify architectural components and functions in PIC 18F Microcontroller.
ISC604.1	
ISC604.2	Develop software programs using MPLAB IDE in assembly and embedded C programming.
	Interface peripheral components with PIC 18F Microcontroller using serial communication protocols
ISC604.3	
ISC604.4	Select appropriate task scheduling model and algorithm to develop Real time operating system.
ISC605	Industrial Data Communication

ISC605.1	Categorize network components using OSI reference model, LAN architecture and topology.
ISC605.2	Select network protocol based on sensor, device, control level in field communication
ISC605.3	Analyse HART communication protocol based on architecture, troubleshooting, benefits and wireless technologies based on characteristics, comparison and limitations
ISC605.4	Analyse foundation fieldbus protocol based on features, advantage, architecture.
ISC606	Analytical Instrumentation
ISC606.1	Examine fundamentals of spectroscopy for qualitative and quantitative analysis and distinguish between Atomic Absorption and Emission Spectroscopy on the basis of principle, instrumentation and operation.
ISC606.2	Select Molecular spectroscopic techniques by studying its terms, principle, instrumentation, operation and applications.
ISC606.3	Compare Separation techniques on the basis of its terms, principle, instrumentation, operation and applications.
ISC606.4	Compare radiation detectors and gas analyzers for their principle, instrumentation, operation and applications.

ISC701	Industrial Process Control
ISC701.1	Analyze control system for Heat Transfer unit operations: Heat Exchanger, Boiler, Evaporator and Furnace.
ISC701.2	Analyze control system for Mass Transfer unit operations: Crystallizer, Dryer and Distillation.
ISC701.3	Examine the instrumentation required for Batch and Continuous Process Industries.
ISC701.4	Analyze control system for Reactor and Compressor. Classify Equipment Safety for processes.
ISC702	Biomedical Instrumentation
ISC702.1	Examine biopotential signals with specifications and their measuring instruments.
ISC702.2	Examine various cardiovascular parameters and their measurement techniques.
ISC702.3	Analyse applications of life support systems.
ISC702.4	Compare medical imaging techniques and identify electrical safety measure in biomedical instruments.
ISC703	Advanced Control Systems
ISC703.1	Classify nonlinearities, identify characteristics of non-linear system, linearize nonlinear systems and construct the trajectories for nonlinear systems using delta method
ISC703.2	Derive the describing function of a given nonlinearity and analyze the stability of nonlinear systems using describing function approach
ISC703.3	Analyze the stability of nonlinear systems using the Lyapunov's stability criteria and construct Lyapunov function using Krasovskii/Variable Gradient method
ISC703.4	Design IMC with Uncertainty and Disturbances
ISC704	Process Automation
ISC704.1	Develop PLC programming skills to automate given processes using Ladder diagram, Function block diagram, Instruction List, Sequential Flow chart, Structured Text
ISC704.2	Develop DCS programming using Function block diagram for a given industrial applications.

ISC704.3	Develop GUI for industrial applications using SCADA.
ISC704.4	Analyze Safety Instrumented System. Compare / integrate MES and ERP in industry.
ISE705X	Elective
ISE7053	Functional Safety
	Differentiate between SIS, SIF, SIL, and identify layers of protection and to measure risk
ISE7053.1	
	Apply safety standard suitable to a process/an application as well as identify phases of Safety Life Cycle and SIS technologies
ISE7053.2	
	Apply rules of probability to the process events, Apply ALARP, LOPA, Risk Graph, Risk Matrix methods to find Safety Integrity Level
ISE7053.3	
	Analyse process hazards with consequence analysis, likelihood analysis, fault propagation, event tree analysis method
ISE7053.4	
ISE7054	Process Modeling and Optimization
ISE7054.1	Develop mathematical models of engineering systems.
ISE7054.2	Formulate and solve linear programming problems.
ISE7054.3	Evaluate non – linear constrained and unconstrained optimization problems.
	Evaluate non – linear unconstrained 1 – D optimization problems using numerical techniques.
ISE7054.4	
ISP706	Project I
	Explore beyond the curriculum to identify problems of society, industrial or research needs; investigate the problem through in-depth literature survey and propose appropriate solution to solve the problem.
ISL706.1	
	Implement the methodology with modern tools and provide sustainable solution with effective utilization of the resources available.
ISL706.2	
	Analyze and compare the results with the standard results
ISL706.3	
	Work as an individual and contribute as a team member with effective management skills to achieve a common objective
ISL706.4	
	Write and present their work effectively with ethical values
ISL706.5	
	Engage themselves in the area of their interest by applying the knowledge gained and explore new technical trends
ISL706.6	
ISC801	Digital Control System
	Convert a continuous time system to discrete time system using impulse invariance/step invariance/BLT/Euler method
ISC801.1	
	Analyze stability/steady state performance of discrete LTI system, represent a discrete LTI system in state space and analyze it.
ISC801.2	
	Design controller and observer for a discrete LTI system to meet specified design criteria
ISC801.3	
	Design a discrete PID controller using transfer function approach
ISC801.4	
ISC802	Instrumentation Project Documentation and Execution
ISC802.1	Compare types of projects with identifying related activity and standard
ISC802.2	Develop industrial project documents for given industrial application
ISC802.3	Identify System Integration activities
ISC802.4	Survey of standards software packages used in instrumentation industry

ISC803	Instrument and System Design
ISC803.1	Analyze transducers on the basis of selection guidelines ,designing criteria & calibration methods. Calculate Reliability parameters for given systems
ISC803.2	Select , size control valves and actuators for given applications.
ISC803.3	Analyze control room layout and control panels
ISC803.4	Analyze design considerations for electronic product and enclosure
ISE804X	Elective
ISE8041	Nuclear Instrumentation
ISE8041.1	Examine properties of α , β and γ and their interaction with matter.
ISE8041.2	Compare radiation detectors on the basis of construction, working, applications, advantages and disadvantages.
ISE8041.3	Analyze electronics and counting systems in Nuclear spectroscopy.
ISE8041.4	Analyze case studies of Nuclear Instrumentation applications in Medicine, Agriculture and Process industry.
ISE8042	Power Plant Instrumentation
ISE8042.1	Survey world and Indian energy scenario for conventional and nonconventional energy resources.
ISE8042.2	Categorize conventional energies
ISE8042.3	Categorize non conventional energies
ISE8042.4	Compare thermal,hydro,nuclear,solar,wind energy sources based on efficiency,size,performance .
ISP 805	Project II
ISL805.1	Explore beyond the curriculum to identify problems of society, industrial or research needs; investigate the problem through in-depth literature survey and propose appropriate solution to solve the problem.
ISL805.2	Implement the methodology with modern tools and provide sustainable solution with effective utilization of the resources available.
ISL805.3	Analyze and compare the results with the standard results
ISL805.4	Work as an individual and contribute as a team member with effective management skills to achieve a common objective
ISL805.5	Write and present their work effectively with ethical values
ISL805.6	Engage themselves in the area of their interest by applying the knowledge gained and explore new technical trends