

Vidyavardhini's college of Engineering & Technology Vasai (W)
Department of Instrumentation Engineering
R-2016

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:	Apply fundamentals of applied sciences, engineering mathematics, electrical, electronics, measurements and control to work as a successful professional in automation as well as interdisciplinary fields.
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 principles of basic operations of matrices ,rank and echelon form of matrices to solve linear simultaneous equations.
FEC101.2	Able solve and Analyze Partial Derivatives and apply it in related field of Engineering
FEC101.3	Able apply the concepts of Complex Numbers,hyperbolic functions and logarithmsto solve engineering problems.
FEC101.4	Able 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	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	Determine the output of LED, photoconductor and photovoltaic cell applying concepts of semiconductor physics,diffractometer application.rotating crystal method & powder method
FEC102.3	Calculate parameters of superconductor viz. Critical temperature, critical magnetic field and differentiate application of superconductor based on Mesinner effect and Josephson effect photovoltaic cell measurements.
FEC102.4	Design acoustic of hall/auditorium using reasons for acoustic defects and Select method for production of ultrasonic waves. capacitors.
FEC103	Applied Chemistry I
FEC103.1	Analyze the quality of water and suggest methods of treatment.
FEC103.2	Illustrate the knowledge of polymers, fabrication methods, conducting polymers in industrial fields.
FEC103.3	Apply the knowledge of lubricants, their properties & mechanism to avoid frictional resistance and interpret phase transformations using thermodynamics
FEC103.4	Demonstrate knowledge of portland cement.
FEC104	Engineering Mechanics
FEC104.1	Illustrate the concept of force, moment and apply the same along with the concept of equilibrium in two and three dimensional systems with the help of FBD.
FEC104.2	Demonstrate the understanding of Centroid and its significance and locate the same

FEC104.3	Estimate required force to overcome friction and correlate real life application to specific type of friction.
FEC104.4	Establish relation between velocity and acceleration of a particle and analyse the motion by plotting the relation.
FEC104.5	Illustrate different types of motions and establish Kinematic relations for a rigid body.
FEC104.6	Analyse body in motion using force and acceleration, work-energy, impulse-momentum principles
FEC105	Basic Electrical Engineering
FEC105.1	To understand fundamentals of DC circuits and apply knowledge for analyzing network theorems in DC circuits.
FEC105.2	Able to learn the fundamentals and analyze single phase AC circuits.
FEC105.3	Able to learn the basic operation and analyze the performance of single-phase transformer.
FEC105.4	Able to learn the fundamentals and analyze three phase AC circuits and understand the construction, basic operation of DC motors and generators.
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, Dovetel 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	Able to apply euler, runge kutta method to solve differential equations of second and fourth order and apply trapezoidal, simpson's 1/3rd, simpson's 3/8 th rule to solve definite integrals numerically and by using scilab.
FEC201.2	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	Able to apply Beta, Gamma functions and D.U.I.S. to evaluate definite integrals.
FEC201.4	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	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 interference application and calculate missing order, grating element wavelength of light using diffraction grating considering parameter viz resolving power of grating
FEC202.2	Compare characteristics of images received by photography and holography using concept of LASER
FEC202.3	Calculate critical angle, angle of acceptance, V number, number of modes of propagation, numerical aperture of step index fibre
FEC202.4	Apply concept of electromagnetism in focussing system and CRO
FEC203	Applied Chemistry II
FEC203.1	Illustrate types of corrosion & suggest control measures in industries.
FEC203.2	Analyze the quality of fuel & calculate the oxygen required for combustion of fuel.
FEC203.3	Illustrate composition, properties of alloys & properties & application of composite material.
FEC203.4	Illustrate the principles of green chemistry
FEC204	Engineering Drawing
FEC204.1	Apply the basic principles of projections in Projection of Lines, Planes and Engineering Curves
FEC204.2	Apply the basic principles of projections in Projection of Solids & Section of solids
FEC204.3	Visualize the given 3D object and draw Orthographic projections
FEC204.4	Draw Isometric view from the given orthographic projections
FEC204.5	Draw Orthographic and Isometric Projection using AutoCad
FEC205	Structured Programming
FEC205.1	Identify the terminologies in operating system used for computer programming and illustrate the algorithms to support Structure Programming Approach.
FEC205.2	Use Variables, derived data types and control structures to write C program.
FEC205.3	Implement solutions to the problem using strings and functions.
FEC205.4	Use Pointers, Structure-Union and Files for solving complex Computational problem.
FEC206	Communication Skills
FEC206.1	To develop the ability to understand the importance of communication fundamentals and its usage in social context
FEC206.2	Develop message generating and delivery skills, gain insight into their own speaking skills
FEC206.3	Can draft letters and other technical documents paying attention to the writer's objectives and reader's needs
FEC206.4	Implement all the important aspects of reading including skimming, scanning, note making and discourse coherence
FEL201	Basic Workshop II
FEL201.1	Model different prototypes in the carpentry trade such as Cross cut lap joint, Tee lap joint, Dovetel lap joint.

FEL201.2	Model various basic prototypes in the trade of fitting such as Square, Hexagonal and V Male Female joint.
FEL201.3	Read various basic Layout drawing; make positive and negative film, and perform PCB etching and drilling, Tinning and soldering operations.
FEL201.4	Dismantle and Assemble a Personal Computer, perform Basic troubleshooting and maintenance, identify network components and perform Basic networking and crimping.
ISC301	Applied Mathematics III
ISC301.1	Apply the concept of fourier series in the field of Control system, Biomedical Instrumentation and Image Processing.
ISC301.2	Apply Laplace transform, inverse Laplace transform in linear time invariant systems to define the transfer function of a system.
ISC301.3	Apply principles of vector differentiation, integral calculus and Bessel function in control theory and electromagnetism.
ISC301.4	Apply Cauchy Reiman equation, Harmonic function, Conformal mapping, Bilinear transformations for designing control systems for given process.
ISC302	Analog Electronics
ISC302.1	Analyze pn junction Diode and Zener diode circuits with d.c. supply.
ISC302.2	Analyze BJT and JFET Circuits with d.c. supply.
ISC302.3	Design linear and nonlinear circuits using operational amplifiers.
ISC302.4	Compare class A, B, AB power amplifiers and analyze series voltage regulated power supply.
ISC303	Transducer-I
ISC303.1	Determine the characteristics and calculate errors of measurement systems.
ISC303.2	Select appropriate displacement transducer for a given application.
ISC303.3	Select appropriate temperature transducer for a given application.
ISC303.4	Select appropriate level, position, velocity, acceleration, vibration, sound, humidity and moisture transducer for a given application.
ISC304	Digital Electronics
ISC304.1	Compute addition, subtraction and multiplication on binary, octal and hexadecimal number system.
ISC304.2	Design computational logic circuits by using Boolean laws-MAP and Quine-Mc-luskey reduction technique up to 4 variables.
ISC304.3	Design sequential / non sequential logic circuit by using flip-flop up to 4 variables.
ISC304.4	Compare RAM, ROM, DDR, NVRAM, bubble memory and PMOS, NMOS, CMOS, E2CMOS logic families.
ISC305	Electrical networks and Measurement
ISC305.1	Analyze circuits with DC and AC sources using KVL and KCL.
ISC305.2	Analyze circuits with DC and AC sources using Thevenin's, Norton's, Maximum power transfer, superposition theorem and Coupled coils.
ISC305.3	Analyze Two port Networks, Network functions, Transient and Steady State responses of passive electrical networks, Network synthesis.
ISC305.4	Use analog and digital instruments for the measurements of R, L and C.

ISL301	Object Oriented Programming and Methodology
ISL301 .1	Apply Object Oriented Programming principles and implement the concept of Class, Object & Method
ISL301 .2	Implement the concept of Array, String, packages, inheritance, and interface
ISL301 .3	Implement run time programming concepts using exception handling and multi-threading.
ISL301 .4	Develop Graphical User Interface using JAVA.
ISL302	Analog Electronics Lab Practice
ISL302.1	Analyze diode circuits such as clipper and clamper circuits.
ISL302.2	Analyze characteristics of BJT and JFET.
ISL302.3	Design circuits for linear applications of operational amplifier.
ISL302.4	Design circuits for nonlinear applications of operational amplifier.
ISL303	Transducer -I Lab Practice
ISL303 .1	Test the characteristics and errors of measuring instruments.
ISL303 .2	Analyze the performance characteristics of displacement transducers-LVDT, Potentiometer and capacitive type.
ISL303 .3	Analyze the performance characteristics of temperature transducers- RTD, Thermocouple and Thermistors.
ISL303 .4	Analyze the performance characteristics of capacitive type level measurement transducer.
ISL304	Digital Electronics Lab Practice
ISL304.1	Design and Implement code conversion up to 4 variable
ISL304.2	Design & implement combinational logic circuit up to 4 variables.
ISL304.3	Design & implement combinational logic circuit using multiplexer circuit.
ISL304.4	Design and implement sequential /non sequential logic circuits up to 4 variables.
ISC401	Applied Mathematics-IV
ISC401.1	Calculate rank of matrix, characteristic equation, characteristic roots and use the applicability of Caylay 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	Transducer-II
ISC402.1	Select appropriate Strain measurement transducer for a given application.
ISC402.2	Select appropriate Pressure and Vacuum measurement transducer for a given application.
ISC402.3	Select appropriate Pressure and Flow measurement transducer for a given application.

ISC402.4	Select appropriate pH, Conductivity, Force, Power, Torque and Density measurement transducer for a given application.
ISC403	Feedback Control System
ISC403.1	Analyze first and second order mathematical model for electrical and mechanical systems.
ISC403.2	Derive transfer function for given SFG and Block diagram of LTI systems.
ISC403.3	Test time domain specifications for first and second order LTI system.
ISC403.4	Analyze LTI systems in time domain using Root locus and frequency domain using polar plot, Nyquist plot and Bode plot.
ISC404	Analytical Instrumentation
ISC404.1	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.
ISC404.2	Select Molecular spectroscopic techniques by studying its terms, principle, instrumentation, operation and applications.
ISC404.3	Compare Separation techniques on the basis of its terms, principle, instrumentation, operation and applications.
ISC404	Compare radiation detectors and gas analyzers for their principle, instrumentation, operation and applications.
ISC405	Signal Conditioning Circuit Design
ISC405.1	Analyze analog and digital signal conditioning circuits.
ISC405.2	Design signal conditioning circuits for thermal and pressure transducers.
ISC405.3	Design signal conditioning circuits for optical transducer, Potentiometer, LVDT, strain gauges, piezoelectric and capacitive type transducer
ISC405.4	Design a power supply using 78xx/ 79xx series and 723, 317 adjustable voltage IC regulator.
ISL401	Application Software Practice
ISL401.1	Design logical operations using Virtual Instrument (VI) and Sub VI.
ISL401.2	Build VIs using one or more than one structures such as Case structure, formula node, for and while loop, shift registers, feedback node, etc.
ISL401.3	Construct VIs involving arrays, clusters, strings, local and global variables and sequence structures.
ISL401.4	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.
ISL402	Transducer -II Lab Practice
ISL402.1	Use strain gauge for measurement of strain, force and torque.
ISL403.2	Analyze the performance characteristics of various transducers for pressure measurement.
ISL403.3	Analyze the performance characteristics of various transducers for flow measurement.
ISL403.4	Demonstrate the performance characteristics of electrochemical sensors used by pH and Conductivity measurement.

ISL403	Feedback Control System Lab Practice
ISL403 .1	Examine transfer function experimentally on Linear Simulator Trainer Kit of Type 0 and Type 1 LTI systems also verify results using MATLAB software.
ISL403 .2	Examine effects of gain variations on transfer function response of first order LTI systems by experiment on Linear Simulator Trainer Kit and verify results using MATLAB software.
ISL403 .3	Examine effects of gain variations on transfer function response of second order LTI systems by experiment on Linear Simulator Trainer Kit and verify results using MATLAB software.
ISL403 .4	Experiment with given under damped second order system on Linear Simulator Trainer Kit and verify results using MATLAB software.
ISL404	Analytical Instrumentation Lab Practice
ISL404.1	Illustrate the concept and working of various spectrometers and analyse the given samples in qualitative and quantitative manner, using spectral techniques.
ISL404.2	Experiment the working of instruments used for clinical analysis, and pharmaceutical laboratories.
ISL404.3	Use specific techniques employed for monitoring different pollutants in air and water, demonstrate the working of various radiation detectors.
ISL404.4	Illustrate the concept of separation science.
ISL405	Signal Conditioning Circuit Design Lab Practice
ISL405.1	Test circuits for linear and nonlinear applications of OPAMP.
ISL405.2	Design and implement signal conditioning circuit for analog transducers used in temperature and pressure measurement.
ISL405.3	Design and implement signal conditioning circuits for optical transducer, Potentiometer, LVDT, strain gauges, piezoelectric and capacitive type transducer.
ISL405.4	Design and implement circuits for Power supply and timer IC 555.
ISC501	Signals and System
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
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	Control System Components
ISC504.1	Analyze pneumatic and hydraulic circuits . Design pneumatic circuits for a given application.
ISC504.2	Select appropriate transmitter for a given application.
ISC504.3	Analyze characteristics of Control Valve and identify Control valve for given application
ISC504.4	Choose auxiliary components depending upon the process requirement
ISDLO 501X	Department Level Optional Course I
ISDLO 5011	Advance sensors
ISDLO 5011.1	Analyze mechanical, electrical, optical, thermal, magnetic, chemical and biological sensors based on principle of physical and chemical transduction.
ISDLO 5011.2	Analyze methods of fabricating a sensor.
ISDLO 5011.3	Analyze design of smart sensors, the techniques of fabrication and application of MEMS.
ISDLO 5011.4	Analyze applications of smart sensors for mechanical, electrical, thermal, magnetic, optical, radiation, chemical and biological fields and study advanced sensing technology.
ISDLO 5012	Optimization Techniques
ISDLO 5012.1	Evaluate statement of optimization for unconstrained and constrained problems using Lagrange multiplier and KT conditions.
ISDLO 5012.2	Formulate and solve linear programming problems by graphical method and simplex method.
ISDLO 5012.3	Solve linear programming problems by two- phase method and dual simplex method.
ISDLO 5012.4	Evaluate unconstrained continuous and discontinuous optimization problems using gradient-based search methods and numerical methods.
ISDLO5013	Database Management System
ISDLO5013.1	Develop data modelling using entity-relation and relational model in DBMS and apply relational algebra on data base.
ISDLO5013.2	Develop database programming skills in SQL by using DDL, DML, DCL, TCL, DQL database languages.
ISDLO5013.3	Use the concept of normalization techniques to normalize the database and Identify the functional dependencies.
ISDLO5013.4	Analyze Transactions Management and Concurrency, concept of Query Processing and Optimization..

ISL501	Business Communication and Ethics
ISL501.1	Develop the interpersonal skills to progress professionally by building stronger relationships
ISL501.2	Design a technical document using precise language, suitable vocabulary and apt style
ISL501.3	Apply the techniques to participate in GD, Interviews and write Resume
ISL501.4	Display competence required for professional career growth
ISL502	Applications of Microcontroller Lab Practice
ISL502.1	Develop software programs in assembly language.
ISL502.2	Develop software programs in embedded C language.
ISL502.3	Interface and implement peripheral components with MCS 51.
ISL502.4	Design the sophisticated application based on MCS-51 such as Traffic light control, Digital weighing machine.
ISL503	Control System Design Lab Practice
ISL503.1	Design and implement Lead compensator on compensation design trainer kit in frequency domain and verify results using MATLAB.
ISL503.2	Design and implement Lag compensator on compensation design trainer kit in frequency domain and verify results using MATLAB.
ISL503.3	Design and verify Lead and Lag compensator for given systems in Time and frequency domain using MATLAB.
ISL503.4	Verify Controllability and Observability of given system using MATLAB.
ISL504	Control System Components Lab Practice
ISL504.1	Develop pneumatic circuits using simulation software
ISL504.2	Examine conventional and smart transmitter features.
ISL504.3	Plot and analyse characteristics of control valve for given application
ISL504.4	Identify auxillary process control components based on application
ISL505	Department Level Optional Course I Lab Practice
ISL505	Advance sensors Lab Practice
ISL505.1	Determine characteristics of thermal sensors.
ISL505.2	Analyze methods of fabricating a sensor.
ISL505.3	Analyze MEMS applications in mechanical, electrical, thermal, magnetic, optical, radiation, chemical and biological fields.
ISL505.4	Select appropriate smart sensors for mechanical, electrical, thermal, magnetic, optical, radiation, chemical and biological fields.
ISL505	Optimization Techniques Lab Practice
ISL505.1	Develop and verify necessary and sufficiency conditions for single and two variable practical design problem.
ISL505.2	Formulate and solve for Linear programming problems with the simplex method algorithm.
ISL505.3	Determine optimal solution for Linear programming problems with the two phase and dual simplex method algorithm.
ISL505.4	Estimate optimal solution for unconstrained optimization problems using numerical methods.

ISL506	Mini Project I
ISL506.1	Select the appropriate software/simulation project through proper survey.
ISL506.2	Design and implement project using appropriate method.
ISL506.3	Carry out performance analysis of the implemented method using quantitative measures.
ISL506.4	Write and present their work effectively with ethical values.
ISC601	Process Instrumentation System
ISC601.1	Identify the dynamic characteristics of a process and determine the response of discrete/continuous mode of controllers.
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 system.
ISC601.4	Develop the physical ladder logic diagram for a given process.
ISC602	Industrial Data Communication
ISC602.1	Demonstrate importance of modulation in communication.
ISC602.2	Examine networking model with its components and compare networks at various level of field communication
ISC602.3	Examine importance of HART communication protocol and compare various wireless technologies.
ISC602.4	Demonstrate application of foundation fieldbus protocol in industry.
ISC603	Electrical Machines and Drives
ISC603.1	Analyze DC motors, single-phase I.M and 3-phase I.M. on the basis of constructional features, working principle and their characteristics.
ISC603.2	Compare power diodes, power BJT, power MOSFET, IGBT and SCR on the basis of construction, characteristics, ratings & applications.
ISC603.3	Analyze controlled Rectifiers, inverter circuits and DC to DC converters.
ISC603.4	Choose AC/DC Drives for the applications involving AC/DC motors.
ISC604	Digital Signal Processing
ISC604.1	Compute Auto/ cross correlation and Linear/ Circular Convolution of digital signal, realize digital filter and verify sampling theorem
ISC604.2	Perform DFT & FFT on digital signal.
ISC604.3	Design FIR and IIR filters for given specification.
ISC604.4	Analyze case studies of applications based on of DSP processor
ISC605	Advance Control System
ISC605.1	Construct the phase-plane trajectories using Delta Method, classify singular points and examine the stability of limit cycle based on response of the system
ISC605.2	Derive DF for common nonlinearities and examine stability of system with limit cycle
ISC605.3	Construct Lyapunov's function and examine the stability of nonlinear system
ISC605.4	Design IMC based PID controller.

ISDLO 602X	Department Level Optional Course II
ISDLO 6022	Computer Organization and Architecture
ISDLO 6022.1	Analyze structure and operation of a digital computer.
ISDLO 6022.2	Perform fixed-point and floating-point addition, subtraction, multiplication & division.
ISDLO 6022.3	Analyze communication methods for I/O devices and hierarchical memory system including cache memories and virtual memory.
ISDLO 6022.4	Analyze Pentium processor Hardware design and pipelining, vector processing methods.
ISDLO 6024	Nuclear Instrumentation
ISDLO 6024.1	Examine properties of α , β and γ and their interaction with matter.
ISDLO 6024.2	Compare radiation detectors on the basis of construction, working, applications, advantages and disadvantages.
ISDLO 6024.3	Analyze electronics and counting systems in Nuclear spectroscopy.
ISDLO 6024.4	Analyze case studies of Nuclear Instrumentation applications in Medicine, Agriculture and Process industry.
ISL601	Process Instrumentation System Lab Practice
ISL601.1	Select different types of control actions for level and pressure control process and evaluate their effect.
ISL601.2	Select various process control schemes for level, pressure and flow processes.
ISL601.3	Use Tuning Technique to fine tune PID controller connected in Level and Pressure control process.
ISL601.4	Develop relay logic, physical ladder and electric control circuit for given processes.
ISL602	Industrial Data Communication Lab Practice
ISL602.1	Calculate modulation index Amplitude Modulation, Frequency Modulation, Pulse Width Modulation of a given analog signal.
ISL602.2	Examine importance of OSI model for given network components in LAN/WAN.
ISL602.3	Analyse HART communication protocol and Wireless technologies.
ISL602.4	Analys foundation fieldbus based on wiring, installation and troubleshooting.
ISL603	Electrical Machines and Drives Lab Practice
ISL603.1	Apply speed control methods for DC motors, single-phase and 3-phase Induction motors.
ISL603.2	Sketch and analyse characteristics of SCR, TRIAC, DIAC and UJT.
ISL603.3	Sketch and Analyze output of controlled Rectifiers, inverter circuits and DC to DC converters.
ISL603.4	Choose AC/DC Drives for the applications involving AC/DC motors.
ISL604	Digital Signal Processing Lab Practice
ISL604.1	Compute Auto/ cross correlation and Linear/ Circular Convolution of digital signal ,realize digital filter and verify sampling theorem
ISL604.2	Perform DFT & FFT on digital signal.
ISL604.3	Design FIR and IIR filters for given specification.
ISL604.4	Analyze case studies of applications based on of DSP processor

ISL 605	Advanced Control System Lab Practice
ISL 605.1	Construct the phase-plane trajectories using Delta Method, classify singular points and examine the stability of limit cycle based on response of the system
ISL 605.2	Derive DF for common nonlinearities and examine stability of system with limit cycle
ISL 605.3	Construct Lyapunov's function and examine the stability of nonlinear system
ISL 605.4	Design IMC based PID controller.
ISL606	Mini Project II
ISL606.1	Select the appropriate software/simulation project through proper survey.
ISL606.2	Design and implement project using appropriate method.
ISL606.3	Carry out performance analysis of the implemented method using quantitative measures.
ISL606.4	Write and present their work effectively with ethical values.

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	Industrial Automation
ISC703.1	Develop PLC programming skills to automate given processes using Ladder diagram, Function block diagram, Instruction List, Sequential Flow chart, Structured Text
ISC703.2	Develop DCS programming using Function block diagram for a given industrial applications.
ISC703.3	Develop GUI for industrial applications using SCADA.
ISC703.4	Analyze Safety Instrumented System. Compare / integrate MES and ERP in industry.
ISDLO703X	Department Level Optional Course III
ISDLO7031	Image Processing
ISDLO7031.1	Apply the concepts of neighbourhood, adjacency, connectivity, distance measures to find the relationship between pixels
ISDLO7031.2	Apply 2-D DFT, FFT and walsh, hadamard, cosine, haar, slant, KL transforms on digital image

ISDLO7031.3	Apply image enhancement techniques on digital image and compare Image Enhancement and Restoration
ISDLO7031.4	Apply Image Segmentation, Image Compression and Morphological operations on the digital image
ISDLO7032	Digital Control System
ISDLO7032.1	Convert a continuous time system to discrete time system using impulse invariance/step invariance/BLT/Euler method
ISDLO7032.2	Analyze stability/steady state performance of discrete LTI system, represent a discrete LTI system in state space and analyze it.
ISDLO7032.3	Represent a discrete LTI system in state space and analyze it.
ISDLO7032.4	Design controller and observer for a discrete LTI system to meet specified design criteria
ISL701	Industrial Process Control Lab Practice
ISL701.1	Examine control system for Heat Transfer unit operations: Heat Exchanger, Boiler, Evaporator and Furnace.
ISL701.2	Examine control system for Mass Transfer unit operations: Crystallizer, Dryer and Distillation.
ISL701.3	Survey the instrumentation required for Batch and Continuous Process Industries.
ISL701.4	Examine control system for Reactor and Compressor. Classify Equipment Safety for processes.
ISL702	Biomedical Instrumentation Lab Practice
ISL702.1	Plot biopotential signals and Examine their measuring instruments.
ISL702.2	Examine instruments to measure cardiovascular parameters.
ISL702.3	Examine life support systems and their circuitry
ISL702.4	Compare medical imaging techniques based on principle, application and Identify electrical safety in biomedical measurements.
ISL703	Industrial Automation Lab Practice
ISL703.1	Develop PLC programming skills to automate given processes using Ladder diagram, Function block diagram, Instruction List, Sequential Flow chart, Structured Text
ISL703.2	Develop DCS programming using Function block diagram for a given industrial applications.
ISL703.3	Develop GUI for industrial applications using SCADA.
ISL703.4	Analyze Safety Instrumented System. Compare / integrate MES and ERP in industry.
ISL704	Department Level Optional Course III
ISL704	Image Processing Lab Practice
ISL704.1	Apply translation, rotation scaling on digital images
ISL704.2	Implement and visualize 2-D DFT, FFT and DCT of the digital image
ISL704.3	Perform enhancement and restoration techniques on the digital image
ISL704.4	Perform segmentation, compression and morphological operations on the digital image

ISL704	Digital Control System
ISL704.1	Discretize an analog systems and obtain the Pulse transfer function
ISL704.2	Represent a discrete LTI system in controllable/observable canonical form
ISL704.3	Determine state transition matrix using simulation software and verify the results analytically
ISL704.4	Design controller and observer for a discrete LTI system to meet specified design criteria
ISL705	Project - I
ISL705.1	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.
ISL705.2	Implement the methodology with modern tools and provide sustainable solution with effective utilization of the resources available.
ISL705.3	Analyze and compare the results with the standard results
ISL705.4	Work as an individual and contribute as a team member with effective management skills to achieve a common objective
ISL705.5	Write and present their work effectively with ethical values
ISL705.6	Engage themselves in the area of their interest by applying the knowledge gained and explore new technical trends
ILO701X	Institute Level Optional Course I
ILO7013	Management Information System
ILO7013.1	Identify the impact of information systems on an organization
ILO7013.2	Use tools and technologies to access database information for improving business performance and decision making
ILO7013.3	Design an IT infrastructure for MIS
ILO7013.4	Identify the Transaction Processing, Functional Area Information and ERP system for enterprise-wide knowledge management
ILO7016	Cyber Security and Laws
ILO7016.1	Illustrate the concept of cybercrime, cyber-frauds, cybercriminal types with their motives and relate legal issues with respect to cybercrime.
ILO7016.2	Analyze and discriminate cyberattack types with tools used for attacks.
ILO7016.3	Identify the security challenges presented by mobile devices and infer measures for protecting the same.
ILO7016.4	Discover and apply different aspects of cyber law and Information Security Standards compliance.
ILO7017	Disaster Management and Mitigation Measures
ILO7017.1	Illustrate scenario of disaster and its effects in India
ILO7017.2	Compare Manmade and Natural disasters and their extent and possible effects on the economy
ILO7017.3	Outline the Government Policies, acts and administration
ILO7017.4	Employ the knowledge of Institutional Framework for Disaster Management in India
ILO7017.5	Apply the knowledge of Financing and Relief Measures

ILO7017.6	Utilize the knowledge of preventive and mitigation measures to know the simple do's and don'ts in disasters
ILO7018	Energy Audit and Management
ILO7018.1	Compare the present state of energy security and its importance to achieve sustainability
ILO7018.2	Explore the basic principles and methodologies adopted in energy audit of an utility
ILO7018.3	Evaluate the energy performance of electrical installations and identify the energy saving opportunities
ILO7018.4	Evaluate the energy performance of some common thermal installations and identify the energy saving opportunities
ILO7018.5	Analyse the data collected during performance evaluation and recommend energy saving measures
ISC801	Instrumentation Project Documentation and Execution
ISC801.2	Compare types of projects with identifying related activity and examine standards used in instrumentation projects.
ISC801.2	Develop industrial project documents for given industrial application
ISC801.3	Identify System Integration activities and survey of standard software packages used in the instrumentation industry.
ISC801.4	Schedule and evaluate activities like procurement, commissioning, installation for instrumentation projects.
ISC802	Instrument and System Design
ISC802.1	Analyze transducers on the basis of selection guidelines ,designing criteria & calibration methods. Calculate Reliability parameters for given systems.
ISC802.2	Select , size control valves and actuators for given applications.
ISC802.3	Analyze control room layout and control panels.
ISC802.4	Analyze design considerations for electronic product and enclosure.
ISDLO 804X	Department Level Optional Course IV
ISDLO8044	Power Plant Instrumentation
ISDLO8044.1	Survey world and Indian energy scenario for conventional and nonconventional energy resources.
ISDLO8044.2	Categorize conventional energies
ISDLO8044.3	Categorize non conventional energies
ISDLO8044.4	Compare thermal,hydro,nuclear,solar,wind energy sources based on efficiency,size,performance .
ISDLO 8045	Functional Safety
ISDLO 8045.1	Differentiate between SIS, SIF, SIL, and identify layers of protection and to measure risk
ISDLO 8045.2	Identify phases of Safety Life Cycle, apply safety standard suitable to an application as well as identify SIS technologies
ISDLO 8045.3	Apply rules of probability to the process events and to calculate Safety Integrity Level by applying various methods.
ISDLO 8045.4	Evaluate process hazards by applying consequence analysis, likelihood analysis, fault propagation, event tree analysis etc.

ISL801	Instrumentation Project Documentation and Execution
ISL801.1	Develop industrial project documents for given industrial application
ISL801.2	Develop installation diagrams for field instruments.
ISL801.3	Identify and apply procurement, installation procedure, pre-commissioning and commissioning activities with Inspection.
ISL801.4	Survey of standard software packages used in instrumentation industry
ISL802	Instrument and System Design Lab Practice
ISL802.1	Calculate performance characteristics of a given transducer and calibrate transducers. Calculate Reliability parameters for given systems
ISL802.2	Select , size control valves and actuators for given applications.
ISL802.3	Analyze control room layout and control panels
ISL802.4	Analyze design considerations for electronic product and enclosure
ISL 803	Department Level Optional Course IV Lab Practice
ISL 803	Power Plant Instrumentation
ISL 803.1	Survey world and Indian energy scenario for conventional and nonconventional energy resources.
ISL 803.2	Categorize conventional energies
ISL 803.3	Categorize non conventional energies
ISL 803.4	Compare thermal,hydro,nuclear,solar,wind energy sources based on efficiency,size,performance .
ISL803	Functional Safety
ISL 803.1	Differentiate between SIS, SIF, SIL, and identify layers of protection and to measure risk
ISL 803.2	Apply safety standard suitable to a process/an application as well as identify phases of Safety Life Cycle and SIS technologies
ISL 803.3	Apply rules of probability to the process events, Apply ALARP, LOPA, Risk Graph, Risk Matrix methods to find Safety Integrity Level
ISL 803.4	Analyse process hazards with consequence analysis, likelihood analysis, fault propagation, event tree analysis method
ISL804	Project - II
ISL804.1	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.
ISL804.2	Implement the methodology with modern tools and provide sustainable solution with effective utilization of the resources available.
ISL804.3	Analyze and compare the results with the standard results
ISL804.4	Work as an individual and contribute as a team member with effective management skills to achieve a common objective
ISL804.5	Write and present their work effectively with ethical values
ISL804.6	Engage themselves in the area of their interest by applying the knowledge gained and explore new technical trends
ILO802X	Institute Level Elective Course II

ILO8021	Project Management
ILO8021.1	Identify appropriate projects from various options and mention their selection criteria.
ILO8021.2	Develop Work Breakdown Structure to prepare the schedule for the project.
ILO8021.3	Identify and predict the opportunities and threats and to decide various strategic approaches to deal with projects.
ILO8021.4	Evaluate project performance using Earned value Technique and Prepare a final report considering analysis, Success and failures for the project.
ILO8023	Entrepreneurship Development and Management
ILO8023.1	Student will be able to create a business plan with technical and commercial details
ILO8023.2	Interpret key regulations and legal aspects of entrepreneurship in India and apply appropriately to given business.
ILO8023.3	Student will be able to employ government policies for promotion of business.
ILO8023.4	Student will be able to select funding option for given business plan
ILO8025	Professional Ethics and Corporate Social Responsibility
ILO8025.1	Use professional ethics to express rights and duties of business also explore professional ethics in the marketplace.
ILO8025.2	Demonstrate professional ethics of consumer protection and job discrimination.
ILO8025.3	Distinguish all aspects of corporate social responsibility.
ILO8025.4	Criticise corporate social responsibility in globalizing India.
ILO8029	Environmental Management
ILO8029.1	Illustrate the significance of Environment Management and sustainable
ILO8029.2	Identify Global Environmental Concerns and Hazards
ILO8029.3	Employ the Concept of Ecology and interdependence between ecosystem and living organisms
ILO8029.4	Utilize the knowledge of Scope of Env Management and Corporate Env Responsibility
ILO8029.5	Outline the EMS Certification and ISO-14000
ILO8029.6	Interpret Environment related legislations and acts