VIDYAVARDHINI'S COLLEGE OF ENGINEERING AND TECHNOLOGY
DEAPRTMENT OF INSTRUMENTATION ENGINEERING
PROGRAMME SPECIFIC OUTCOMES (PSO) & COURSE OUTCOMES (CO)
ACADEMIC YEAR 2017-18

PSO	Program Specific Outcomes of Instrumentation Engineering
PSO1	**Measurement:** Apply the concept of measurement and sensing, to select, calibrate and troubleshoot measuring instrument for process parameters in various industries.
PSO2	**Control Systems & Safety:** Select and design control schemes, controllers and safety systems for various industrial processes.
PSO3	**Automation:** Automate various processes using Programmable Logic Controllers (PLC), Supervisory Control & Data Acquisition Systems (SCADA) and Distributed Control Systems.
PSO4	**Embedded systems & Applied Instrumentation:** Design microprocessor & microcontroller based systems and analyze various biomedical, analytical and nuclear instruments.

ISL301	Applied Maths-III
ISL301.1	Demonstrate basic knowledge of Laplace transform and will be able to solve ODEs using Laplace transform.
ISL301.2	Expand a given function using Fourier series Expansion.
ISL301.3	To identify the analytic function, harmonic function, Orthogonal trajectories and to find bilinear transformations and Conformal mappings.
ISL301.4	Apply Green's theorem, Divergence theorem and Stoke's theorem to calculate line integral, surface and volume integral. And will be able to solve Bessel's equation.

ISC302	ANALOG ELECTRONICS
ISC302.1	Students will able to introduce with basic electronic devices and circuits
ISC302.2	Students will able study the operation of diode, bipolar and MOSFET transistor, DC biasing circuit.
ISC302.3	Students will able study the operation of OP-AMP circuit.
ISC302.4	Students will able to understand knowledge power circuit systems and regulated power supply.

ISL302	ANALOG ELECTRONICS LAB
ISL302.1	To demonstrate operation of diodes, bipolar and MOS transistors,
ISL302.2	Demonstrate DC biasing circuits, Transistors as switching device,
ISL302.3	Power circuits and systems
ISL302.4	To design and demonstrate Op-amp based circuits for linear and nonlinear applications

ISC303	Transducers - I
ISC303.1	Students will be able to define measurement, errors, transducers and sensors and describe various components of measurement systems, classify transducers and explain the selection criteria for the same. Also describe the construction and working of some transducers such as Humidity, Light, etc.
ISC303.2	Students will be able to compare various Displacement measurement transducers on the basis of their construction, working, advantages, disadvantages and applications.
ISC303.3	Students will be able to identify and compare various Temperature measurement transducers on the basis of their construction, working, advantages, disadvantages and applications.
ISC303.4	Students will be able to identify and compare various Level measurement transducers on the basis of their construction, working, advantages, disadvantages and applications.

ISL303	Transducers – I Lab Practice
ISL303.1	The students will be able to explain measurement techniques, measuring equipment, classify sensors, transducers, and their brief performance characteristics.
ISL303.2	The students will be able to examine characteristics of various displacement transducers.
ISL303.3	The students will be able to examine characteristics of various temperature transducers.
ISL303.4	The students will be able to examine characteristics of various level transducers.

ISC304	DIGITAL ELECTRONICS
ISL304.1	Students will be able to learn conversion of numerical values in various number systems, Knowledge of logic gates.
ISL304.2	Demonstrate knowledge of various reduction techniques also analyze and design various combinational logic circuit
ISL304.3	Ability to understand various types of sequential /non sequential logic circuit also analyzes and designs various sequential /non sequential logic circuits.
ISL304.4	To demonstrate knowledge of electronics memory, Programmable logic device and logic family

ISL304	DIGITAL ELECTRONICS Lab
ISL304.1	Students will be able to Implement code conversion
ISL304.2	Students will be able to reduce & implement combinational logic circuit
ISL304.3	Students will be able to reduce & implement multiplexer circuit

ISL304.4	Students will be able to implement various types of sequential /non sequential logic circuit also analyzes and designs various sequential /non sequential logic circuits

ISL305	Electrical Networks and Measurement
ISL305.1	Students will be able to Analyze AC and DC circuits using different theorems
ISL305.2	Analyze transient and steady-state response of passive electrical networks.
ISL305.3	Analyze network using poles and zeros and find their parameters like Z, Y, and ABCD.Synthesize the networks using canonical forms
ISL305.4	Discuss construction and working principle and applications of analog and digital instruments.Measure electrical parametr like R,L,C using electrical bridges

ISC401	Applied Maths-IV
ISC401.1	Apply matrix theory to solve system of linear equations and eigen values and eigen vectors and their applications.
ISC401.2	Evaluate the contour integrals to identify and classify Zeroes, Singular points, Residues and their applications.
ISC401.3	Apply method of Calculus of Variation to specific systems.
ISC401.4	Understand the basic concepts of Linear Algebra

ISC402	Transducer II
ISC402.1	To make students understand the construction, working principle and application of flow and strain measurement transducers
ISC402.2	To make students understand the construction, working principle and application of pressure and vacuum measurement transducers
ISC402.3	To study electro chemical sensors
ISC402.4	To study transducers for density and viscosity measurement

ISL402	Transducer II Lab Practices
ISL402.1	To make students understand the construction, working principle and application of flow and strain measurement transducers
ISL402.2	To make students understand the construction, working principle and application of pressure and vacuum measurement transducers
ISL402.3	To study electro chemical sensors for density and viscosity measurement
ISL402.4	To experimentally verify the principle and characteristics of various sensors

ISC403	Feedback Control System

ISC403.1	Identify open and closed loop control system.
ISC403.2	Formulate mathematical model for physical systems
ISC403.3	To able to demonstrate knowledge D.C. analysis of diode, BJT and JFET Circuits
ISC403.4	To able to understand operation of OP-AMP Circuits.
ISC403.5	Apply root locus technique for stability analysis.Analyze performance characteristics of system using Frequency response methods.

ISL403	Feedback Control System
ISL403.1	Plot frequency response of first-order electrical system.Plot time response of second-order electrical system and calculate the steady-state error.
ISL403.2	Demonstrate their knowledge to obtain the transfer function and transient and steady state response to test signals such as step, ramp, and parabolic
ISL403.3	Understand the effect of damping factor on system response.
ISL403.4	Inspect the time response specifications of systems by using root-locus.Inspect the frequency response specifications of systems by using bode-plot, Polar plot, Nyquist-plot techniques, and comment on the stability of system.

ISC404	Analytical Instrumentation
ISC404.1	Define and explain various fundamentals of spectroscopy, qualitative and quantitative analysis.
ISC404.2	Discuss the terms, principle, instrumentation, operation and applications of molecular spectroscopic techniques.
ISC404.3	Differentiate between principle, instrumentation and operation of Atomic absorption and emission Spectroscopy
ISC404.4	Explain the various Separation techniques and its instrumentation.
ISC404.5	Describe the principle and working of various Radiation detectors.
ISC404.6	Discuss the principle and working of various Gas analyzers.

ISL404	Analytical Instrumentation Lab Practice
ISL404.1	Illustrate the concept and working of various spectrometers using different samples.
ISL404.2	Analyze the given sample in qualitative and quantitative manner, using spectral techniques
ISL404.3	Use specific techniques employed for monitoring different pollutants in air and water
ISL404.4	Demonstrate the working of various radiation detectors
ISL404.5	Experiment the working of instruments used for clinical analysis, and

ISL404.6	Illustrate the concept of separation science

ISC405	SIGNAL CONDITIONING CIRCUIT DESIGN
ISC 405.1	Students will be able to explain the analog signal conditioning circuits
ISC 405.2	Students will be able to explain the digital signal conditioning circuits
ISC 405.3	Apply knowledge of analog and digital signal conditioning for designing signal conditioning for analog and digital transducers such as temperature, displacement, flow, optical etc.
ISC 405.4	Apply the knowledge to design different power supplies

ISL405	SIGNAL CONDITIONING CIRCUIT DESIGN lab
ISL405.1	Students will be able to implement various applications of Op-Amp
ISL 405.2	Students will be able to design signal conditioning circuit for analog transducer
ISL 405.3	Students will be able to design signal conditioning circuit for digital transducer
ISL 405.4	Power supply design and 555 timer in various modes

ISC501	Signals and systems
ISC501.1	To understand the significance of signals and systems in the time and frequency
ISC501.2	To study linear time invariant systems
ISC501.3	To analyse the signals using Fourier Series and Fourier Transform
ISC501.4	To design the system using Laplace transform and Z transform

ISC 502	Microcontroller and Applications
ISC 502.1	Define Microprocessor and Microcontroller family with comparison
ISC 502.2	Understand working of 8051/8052and MCS251 Microcontroller Architecture and Programming model.
ISC 502.3	Understand the concept of Timer, Interrupt, I/O Port interfacing with 8051 Microcontroller.
ISC 502.4	Understand the concept of Interfacing with Real time System

ISC 503	Control System Design
ISC 503.1	The students will be able to represent any system in any canonical form.
ISC 503.2	The students will be able to dtermine response of system
ISC 503.3	The students will be able to design Lead, Lag and Lag-Lead compensator using frequency domain method and time domain method.
ISC 503.4	The students will be able to design PID compensator.

ISC504	SIGNAL CONDITIONING CIRCUIT DESIGN
ISC504.1	Understand principle of working of various signal conditioners used with Temperature, Displacement, Optical and various miscellaneous other sensors.
ISC504.2	Design signal conditioning circuits for various transducers.
ISC504.3	Understand applications of various signal conditioners used in industry

ISC504.4	Capable of selecting best suited signal conditioners for any given application.

ISC505	Control System Components
ISC505.1	The students will demonstrate different control system components like pumps, compressors, flapper nozzle.
ISC505.2	The students will demonstrate working of different pneumatic circuits like Single acting cylinder, Double acting cylinder hydraulic braking systems by using directional control valves.
ISC505.3	The students will demonstrate the knowledge of control valves, installation, different valve accessories.
ISC505.4	The students will learn importance of Alarm annunciators system, square root extractor, pressure and level switches

ISC506	Bussiness Communication & Ethics
ISC506.1	The student will be able to design a technical document using precise language, suitable vocabulary and apt style.
ISC506.2	The student will be able to develop the life skills/interpersonal skills to progress professionally by building stronger relationships.
ISC506.3	The student will be demonstrate awareness of contemporary issues knowledge of professional and ethical responsibilities.
ISC506.4	The student will be able to apply the traits of a suitable candidate for a job/higher education, upon being trained in techniques of holding a group discussion, facing interviews and writing resume/SOP.
ISC506.5	The student will be able to deliver formal presentation effectively implementing the verbal and non-verbal skills.

ISDLO5011	ADVANCED SENSORS
ISDLO5011.1	To expose the students to various principles employed in transducers.
ISDLO5011.2	To introduce the students to the concepts of smart sensors and micro sensors
ISDLO5011.3	To provide sufficient knowledge about the sensor fabrication
ISDLO5011.4	To create awareness about the various application fields of smart sensors.

ISDLO5012	OPTIMIZATION TECNIQUE
ISDLO5012.1	Translate descriptive statements of the design engineering problems in to a mathematical statement of optimization

ISDLO5012.2	Translating linear programming problem (LPP) in to standard form and then use simplex or two phase simplex method and Use alternate form of two-phase simplex method called Big-M method also write dual problem for the given LP Problem for solving it
ISDLO5012.3	Explain gradient-based search and direct search methods for design optimization problems
ISDLO5012.4	Use the numerical methods for unconstrained optimization

ISDLO5012	OPTIMIZATION TECNIQUE LAB
ISDLO5012.1	Formulate practical design problems having two design variables and solve graphically and identify the nature of the problem.
ISDLO5012.2	Apply the simple method algorithm and solve LPP by two-phase simplex method numerically
ISDLO5012.3	Use necessary and sufficient conditions and verify the descent conditions for a given search direction for unconstrained optimization problem
ISDLO5012.4	Calculate step size along search direction using search methods numerically and Apply numerical methods algorithms to solve unconstrained problems

ISC601	Process Instrumentation System
ISC601.1	describe the dynamics of various processes, explain the different modes of controllers and determine their response
ISC601.2	describe the construction and working of hydraulic, pneumatic and electronic controllers, implement them and tune a controller in a process loop
ISC601.3	explain different control schemes, apply them to various processes and compute interaction in multivariable systems
ISC601.4	design the ladder logic for various processes

ISC602	Power Electronics and Drives
ISC602.1	To understand working of various power semiconductor devices
ISC602.2	Students will be able to analyze and design controlled rectifiers
ISC602.3	To understand working of various type Inverters and DC-DC converters
ISC602.4	To understand working of various AC/DC Drives and apply the knowledge to various application of power electronic

ISC603	Digital Signal Processing
ISC603.1	TO DESCRIBE BASIC OF DIGITAL SIGNAL PROCESSING.To sketch realization of FIR and IIR filters using various methods.To describes digital hardware and discuss their applications.
ISC603.2	To compute DFT and FFT of discrete time signal signal using various algorithms.

ISC603.3	To discribe frequncy response of digital filters.To discuss various aspects of multi rate signal processing .
ISC603.4	To design FIR and Iir filters using various methods.

ISC604	Application of Microcontroller-II
ISC604.1	Define Embedded system and its Applications in industry
ISC604.2	Understand working of PIC 18F Microcontroller Architecture and Programming model.
ISC604.3	Understand the concept of Timer, Interrupt, I/O Port interfacing with PIC 18F
ISC604.4	Understand the concept of Interfacing with Real time System

ISC 605	Industrial Data Communication
ISC 605.1	Understand basic reference model, LAN for networking.
ISC 605.1	Understand various architecture/working of different protocol.
ISC 605.1	Make comparative study of various wireless technology.
ISC 605.1	Understand applications of various protocols in industry.

ISC606	Analytical Instrumentation
ISC606.1	Define and explain various fundamentals of spectroscopy, qualitative and quantitative analysis.
ISC606.2	Discuss the terms, principle, instrumentation, operation and applications of molecular and atomic spectroscopic techniques.
ISC606.3	Explain the various separation techniques and its instrumentation.
ISC606.4	Describe the principle and working of various Radiation detectors, X-ray spectroscopy and Gas Analyzers

ISC701	Industrial Process Control
ISC701.1	Students will be able to explain construction, operation and control of Heat Transfer unit operations such as Heat Exchanger, Boiler, Evaporator, Furnace, etc.
ISC701.2	Students will be able to explain construction, operation and control of Mass Transfer unit operations such as Crystallizer, Dryer, Distillation, etc.
ISC701.3	Students will be able to explain Batch and Continuous Process Industries.
ISC701.4	Students will be able to explain construction, operation and control of miscellaneous unit operations such as Reactor, Compressor, etc. and Equipment Safety.

ISC702	Biomedical Instrumentation

ISC702.1	Identify various Bio-potential and their specifications in terms of amplitude and frequency.
ISC702.2	Understand principle and working of various Biomedical Instruments for diagnosis applications.
ISC702.3	Decide the applications of therapeutic instruments for treatment purpose.
ISC702.4	Understand applications of imaging instruments and the modalities involved in each technique.

ISC703	Advance Control System
ISC703.1	Describe different types of nonlinearities and their characteristics, linearize
ISC703.2	Derive the describing function of nonlinearities and based on it analyze their
ISC703.3	Analyze the stability of nonlinear systems using the Lyapunov's stability criteria
ISC703.4	Design IMC with Uncertainty and Disturbances

ISC704	Process Automation
ISC704.1	Define Automation & understand it's application & importance in various industries using PLC.
ISC704.2	Explain evolution & architecture of DCS and able to apply knowledge for various industrial applications
ISC704.3	Discuss SCADA architecture, Develop various application based on SCADA along with GUI.
ISC704.4	Explain the need of SIS ,Alarm Management, MES and ERP in industry.

ISC7052	Image processing
ISC7052.1	To study and understand the fundamentals of DIM
ISC7052.2	To study and understand various image transforms
ISC7052.3	To study and understand image enhancement and image restoration techniques
ISC7052.4	To study and understand image segmentation, compression and morphological processing

ISE7054	Process Modelling & Optimization
ISE7054.1	The students will be able to determine mathematical models of simple as well as complex engineering systems.
ISE7054.2	The students will be able to define & explain various optimization terminologies. Also formulate and solve Linear programming optimization problems.
ISE7054.3	The students will be able to solve non – linear constrained and unconstrained optimization problems.

ISE7054.4	The students will be able to solve non – linear unconstrained 1 – D optimization problems using numerical techniques.

ISC801	Digital Control System
ISC801.1	Discretize a continuous time system using different methods and represent a digital control system in different forms
ISC801.2	Perform stability and steady state analysis of discrete LTI system, represent a discrete LTI system in state space and analyze it.
ISC801.3	Design controller and observer for a discrete LTI system to meet specified design criteria
ISC801.4	Design a discrete PID controller using transfer function approach

ISC802	Instrumentation Project Documentation & Execution
ISC802.1	Design & Develop Basic & Detailed Engineering Project Deliverables
ISC802.2	Understand Types of Project Executed in I & C Projects.
ISC802.3	Develop skills to Execute and carry different activities in process industry
ISC802.4	Overall Development of the students by Hands on working Experience

ISC803	Instrumentation System Design
ISC803.1	To understand design consideration of transducer and basic concept about reliability
ISC803.2	Design and analyze control valve sizing
ISC803.3	Identify various control panel and control room
ISC803.4	Design an electronics product

ISE8041	Nuclear Instrumentation
ISE8041.1	Students will be able to understand basic concepts of radioactivity, properties of α, β and γ and their various effects when they interact with matter.
ISE8041.2	Students will get well versed with construction and working of various radiation detectors.
ISE8041.3	Students will describe electronics and counting systems used in Nuclear spectroscopy.
ISE8041.4	Students will identify and explain various applications of Nuclear Instrumentation in Medicine and Process industry.

ISE8042	Power Plant Instrumentation
ISE8042.1	Students will understand importance of resources and its utilisation
ISE8042.2	students will get well verged with power plant installation consideraion

ISE8042.3	Students also get thorough knowledge of Instrumentation involve in power plants.
ISE8042.4	The students get well versed with all power generation plants.

ISC604	Digital Signal Processing
ISC604.1	TO DESCRIBE BASIC OF DIGITAL SIGNAL PROCESSING.To sketch realization of FIR and IIR filters using various methods.To describes digital hardware and discuss their applications.
ISC604.2	To compute DFT and FFT of discrete time signal signal using various algorithms.
ISC604.3	To discribe frequncy response of digital filters.To discuss various aspects of multi rate signal processing .
ISC604.4	To design FIR and Iir filters using various methods.