



Dr. Ambedkar Institute of Technology, Bangalore – 56

Department of Electronics & Instrumentation Engineering

The attached documents are valid and approved.

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Prof. & Head

5/11/22

Professor & Head

Department of Electronics

Instrumentation Engineering

Dr. Ambedkar Institute of Technology

Bangalore - 560 056

Dr. Ambedkar Institute of Technology
Department of Electronics & Instrumentation Engineering

Course Outcomes

II Year

18EI31	Analog Electronic Circuits
CO1	Define, understand and explain the structure, V-I characteristics, working of analog electronic devices like diodes, Bipolar Junction Transistors (BJTs) and MOSFETs
CO2	Apply the knowledge of Kirchhoff's voltage and current laws to obtain voltage or current waveform at different points in analog electronic circuits such as diode clippers, clampers, amplifiers using BJTs and MOSFETs, power amplifiers, feedback amplifiers
CO3	Analyze analog electronic circuits such as diode clippers, clampers, amplifiers using BJTs and MOSFETs, Power amplifiers, feedback amplifiers.
CO4	Design analog electronic circuits such as diode clippers, clampers, amplifiers using BJTs and MOSFETs, power amplifiers, feedback amplifiers for given specifications.

18EI32	Digital System Design
CO1	Simplify Boolean functions using k-map and Quine-Mc.Cuskey minimization technique
CO2	Utilize the Verilog code to analyze, design and write Verilog code for combinational circuits (MUX, De-MUX, adder, subtractor and comparator circuits)
CO3	Design and analyze code converters, encoders and decoders.
CO4	Analyze and design synchronous sequential circuits.

18EI33	Network Analysis
CO1	Apply basic technique and network theorems to solve for network parameters with AC & DC source.
CO2	Analyze the behavior of resonance in electrical networks.
CO3	Evaluate transient behavior and initial conditions in electrical circuits.
CO4	Apply Laplace transformation to determine the response of electrical networks
CO5	Determine the two port parameters and evaluate relationships between them

18EI34	Measurements and Instrumentation
CO1	Understand the basic concepts of measurement and identification of various symbols
CO2	Apply the concepts of DC/AC bridge circuits, analog and digital instruments, DAS.
CO3	Analyze and evaluate the performance of various electrical and electronic Instruments

CO4	Develop mathematical models, analyze and design various instrument systems and their calibration, through course activities.
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18EI35	Sensors & Applications
CO1	Remember and understand the basic principles of sensors and transducers.
CO2	Apply the knowledge of transducers and sensors in selecting the proper instrumentation systems.
CO3	Analyze and evaluate the performance of different sensors, transducers and converters for various applications.
CO4	Design and create a system using appropriate sensors for a particular application.

18EIL36	Analog Electronics Lab
CO1	Compute the parameters from the characteristics of Diode, BJT, FET, MOSFET devices
CO2	Test the performance of Rectifiers, Oscillator Circuits, Amplifiers
CO3	Design and construct basic electronic circuits using diodes, transistors and FETs
CO4	Demonstrate basic skills on using electronic simulation software

18EIL37	Digital System Design Lab
CO1	Compute the parameters from the characteristics of Diode, BJT, FET, MOSFET devices
CO2	Test the performance of Rectifiers, Oscillator Circuits, Amplifiers
CO3	Design and construct basic electronic circuits using diodes, transistors and FETs
CO4	Demonstrate basic skills on using electronic simulation software
CO5	

18EI41	Process Instrumentation
CO1	Ability to understand the basic concepts of Functional elements of an instrument.
CO2	Ability to understand the concepts of Measurements of Force, Torque, Shaft power
CO3	Ability to explain the techniques of Flow measurements and Pressure measurements and Level measurements.

18EI42	Control Systems
CO1	Generate mathematical models of linear time invariant control system by applying differential equations, transfer function, block diagram and signal flow diagram techniques.
CO2	Transform from electrical to mechanical and vice versa by applying suitable analogy
CO3	Analyze and characterize the behavior of a control system in terms of time domain and frequency domain performance parameters.
CO4	Compute and assess the system stability by applying Routh Hurwitz and root locus

	techniques
CO5	Assess the stability of the system in the frequency domain by applying Nyquist stability criterion and bode Plots
CO6	Design lead, lag and lead lag compensators for the given specifications by drawing root locus and bode plots

18EI43	Microcontroller & Applications
CO1	Explain the concept and applications of Embedded Systems and 8051 microcontroller architecture and simple programming
CO2	Apply the architecture, addressing modes and Analyze instruction set of MSP430 and develop programs for control applications using assembly language and embedded C.
CO3	Use RTC, Timers, ADC and comparator for simple applications.
CO4	Demonstrate Serial communication protocols and programming.
CO5	Interface devices and peripherals to microcontroller and write program

18EI44	Signals & Systems
CO1	To classify the types of signals and systems and determine its properties.
CO2	To apply the defined modifications on the signals
CO3	To analyze Linear time invariant systems (both analog and discrete-time systems) using the time-domain concepts.
CO4	To represent the signals in frequency domain using Fourier representation and Z-Transformation of signals
CO5	To apply Z –transformation for the analysis of systems represented in discrete domain.

18EI45	Linear IC's & Applications
CO1	Understand the fundamental principles of operational amplifiers
CO2	Design and analyze the signal conditioner circuits like Amplifiers, filters, ADC, DAC using operational amplifiers for various applications.
CO3	Design and analyze the signal generator circuits for the given specification
CO4	Use OPAMP for various applications like waveform generation, PLL, Voltage regulator etc
CO5	An ability to identify, formulate, and solve engineering problems related to analog and digital system design using project-based learning approach
CO6	An ability to use the techniques and skills, necessary for engineering practices

18EIL46	Sensors and Signal Conditioning Circuits Lab
CO1	Determine the performance characteristics of transducers and sensors.
CO2	Identify the tools for analysis and simulation.
CO3	Design analog circuits using OP Amp and Timer
CO4	Apply statistical procedure to verify the experimental results.

18EIL47	Microcontroller Lab
CO1	Write the Assembly level programming and explain implementation of various logics
CO2	Demonstrate execution of Arithmetic and logical operation
CO3	Explain Instruction set and addressing modes of microcontroller
CO4	Interface peripherals to the microcontroller to implement its application
CO5	Apply the knowledge of microcontroller architecture to implement application

III Year

18EI51	Digital Signal Processing
CO1	Understand the basics digital signal processing and properties of DFT implementation.
CO2	Implementation of FFT algorithms for efficient computation of the DFT.
CO3	Design and implement FIR filters using windows and frequency sampling techniques for the given specifications.
CO4	Design and implement digital IIR filters for the given specifications.
CO5	Apply the “MATLAB” functions for designing of FIR & IIR filters.
CO6	Apply the digital signal processing concepts in different applications.

18EI52	Communication Technology
CO1	Describe the needs and the principles and working of various analog and digital modulation
CO2	Apply the (demodulation) techniques to recover the signal
CO3	Determine the values of signal parameters analog & digital communication
CO4	Analyze the advancement in multiple access and Satellite communication techniques

18EI53	Process Automation and Control
CO1	Identify and Draw the P& I diagrams for the process system
CO2	Select suitable controller among P,I,D and composite controllers for process control systems
CO3	Design a suitable controllers indicated in CO2 for the given specification using OPamps
CO4	Analyze and apply the controller tuning techniques for process control system
CO5	Choose the proper control system for the automatic control system
CO6	Apply proper safety norms in process industry

18EI54	C++ and Data Structures
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CO1	Remember and understand the basic concepts of OOPs and functions.
CO2	Apply the concepts of OOPs to realize a program for various situations.
CO3	Analyze the real world problems and solve them by implementing the features of data structures.
CO4	Design, implement, test, debug and document the programs in C++.

18EI551	Biomedical Instrumentation
CO1	Remember and understand the basic concepts of a Biomedical instrumentation system
CO2	Explain the basic need of biomedical instrumentation, Purpose of biomedical instrumentation and working of different Biomedical Instruments
CO3	Explain the physiology of biomedical system and different methods and principles in the design of biomedical instruments

18EI552	Power Electronics and Drives
CO1	Analyse the Power semiconductor diodes and circuits.
CO2	Solving numerical problems by using converter and DC choppers specifications.
CO3	Apply and analyse the concept of single and three phase inverter.
CO4	Designing the driver circuit for AC and DC motor.
CO5	Design the driver using converters and gate and base drive circuit and identify suitable switch choices for a given application.

18EI553	Digital Image Processing
CO1	Understand the concepts of digital image processing
CO2	Identify and apply different filtering techniques in both the spatial and frequency domains and restoration techniques.
CO3	Understand and explain the different color image processing models and compression techniques.

18EI554	Automotive Electronics
CO1	Explain the electronics systems used for control of automobiles
CO2	Select a suitable sensors, actuators and control systems for automobiles
CO3	Identify the faults in the systems and sub systems of the automobile

18EIL56	Digital Signal Processing Lab
CO1	Learn to represent analog signals in digital format and understand frequency-domain representation of the signals.
CO2	Apply their knowledge of signal processing to solve the real time problems associated with convolution theorems, filter designs
CO3	Realize and Design FIR and IIR filters,DFT,IDFT.
CO4	Analyze and Implement program for generation and detection of DTMF signals

18EIL57	Control Systems and simulation Lab
CO1	Model a mechanical (masses, dampers and springs) and electrical system (inductors, resistors, capacitors) in the form of a transfer function.
CO2	Analyse the effect of P, PI, PD and PID controllers on a control system
CO3	Perform time response analysis of a second order control system using MATLAB
CO4	Analyse and interpret stability of the system through Root Locus, Bode plot and NY Quist plot.
CO5	Design Lag, Lead, Lead-Lag compensators and verify experimental results using MATLAB.

18EI61	PLC and SCADA
CO1	Identify different components of industrial Automation, PLC, SCADA, RTU
CO2	Construct ladder diagram, instruction list, Structured text, sequential function chart for digital circuits
CO3	Develop the PLC program for an automatic control system using Ladder diagram
CO4	Design a ladder diagram and Instruction list for simple control application
CO5	Apply the knowledge of Timer, counter, shift register data handling to implement digital circuits.

18EI62	Embedded Systems using ARM Controller
CO1	Understand the features of embedded systems, architecture of ARM7 and applications.
CO2	Apply the ARM instruction set in assembly programming for different applications.
CO3	Understand the exception, interrupts and interrupt handling schemes
CO4	Apply the knowledge of hardware and software requirements to various applications of embedded system.
CO5	To become acquainted with RTOS based embedded system design concepts

18EI62	Embedded Systems using ARM Controller
CO1	Understand the features of embedded systems, architecture of ARM7 and applications.
CO2	Apply the ARM instruction set in assembly programming for different applications.
CO3	Understand the exception, interrupts and interrupt handling schemes
CO4	Apply the knowledge of hardware and software requirements to various applications of embedded system.
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18EI63	Advanced Control System
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CO1	Discuss state variable approach for linear time invariant systems in both the continuous and discrete time systems.
CO2	Apply vector and matrix algebra to find the solution of state equations for linear continuous – time and discrete – time systems.
CO3	Define controllability and observability of a system and test for controllability and observability of a given system.
CO4	Design pole assignment and state observer using state feedback.

18EI641	Aircraft Instrumentation
CO1	Understand the concept of different types of instrument, displays and indicators.
CO2	Appraise the elements of Aircraft Instrumentation and Integration of the system to meet the control Navigation and operational requirements of the Aircrafts
CO3	Analyse and evaluate the performance of Aircraft control system and interpret the results.
CO4	Interpreted Case Studies with the theory learnt and hence develop a system concept operational in latest aircraft instrumentation.

18EI642	Robotics and Automation
CO1	Demonstrate the technology and principles associated with robotics and automation systems
CO2	Identify components, advantages, disadvantages, applications of robots.
CO3	Solve direct and inverse kinematics of simple robot manipulators.
CO4	Apply spatial transformation and mathematical equations to obtain the forward kinematic equation of robot manipulators and path planning.

18EI643	Machine Learning using Python Programming
CO1	Develop an understanding of basic machine learning algorithms, their efficient implementations and their applicability to different tasks.
CO2	Illustrate the ability to select and implement machine learning techniques and computing environment that are suitable for the applications under consideration.
CO3	Apply the knowledge of computing and mathematics to machine learning problems, models and algorithms.
CO4	Articulate the basic principles of artificial neural networks towards problem solving, inference, perception, knowledge representation, and learning.

18EI644	VLSI Design
CO1	Explain the VLSI design flow, characteristics and fabrication process of MOS transistors.
CO2	Analyze the performance of MOS/CMOS transistors ,using mathematical methods and circuit analysis models, including logic components and their interconnect
CO3	Apply MOS technology specific layout rules in the placement and Routing of transistors and interconnect, and to verify the functionality, power, and parasitic

	effects.
CO4	Design, combinational, sequential logic, memory cells at the transistor level.
CO5	Analyse and evaluate memory cells including stick diagram.

18EIL66	Embedded System Design Lab
CO1	Describe the programmer's model of ARM processor to create and analyze Assembly level and Embedded C-programming.
CO2	Develop a program and analyze the various built in peripheral devices.
CO3	Demonstrate various communication techniques between the kit and external peripheral modules
CO4	Identify and analyze the function of memory Management unit of ARM.
CO5	Interface ARM microcontroller with external peripherals.

18EIL67	Virtual Instrumentation Lab
CO1	Recognize the components of Virtual instrumentations and use them for PC Based Measurement.
CO2	Use and implement various types of structures used in LabVIEW.
CO3	Analyze and design different type of programs based on data acquisition.
CO4	Create a VI system to solve real time problems.

18EIM68	Mini Project
CO1	Analyze the problem, formulation and solution of the selected project
CO2	Develop solutions for contemporary problems using modern tools for sustainable development.
CO3	Demonstrate ethical and professional sustainability while working in a team and communicate effectively for the benefit of the society.
CO4	Understand the engineering, finance and management principles

18EII69	Industry Internship
CO1	Understanding the modern tools used in the field of Instrumentation for product development.
CO2	Demonstrate ethical conduct and professional accountability while working in a team for the benefit of society.
CO3	Understand the resources requirement and planning to facilitate the project success

IV Year

18EI71	IoT and Wireless Sensor Networks
CO1	Analyze various M2M and IoT architectures (Analyze)
CO2	Apply design concept to IoT solutions (Apply).

CO3	Designing software and programming embedded devices.
CO4	Illustrate the concept of WSN node Architecture and Network Architecture
CO5	Explore MAC and Routing protocols of WSNs

18EI72	Industrial Data Communication & DCS
CO1	Examine the importance of OSI, serial communication standards
CO2	Demonstrate different protocols used in industry
CO3	Apply the different Ethernet topologies in industries.
CO4	Identify the components of DCS
CO5	Apply and Analyse the different algorithms used in DCS
CO6	Implement different applications and the future trends in DCS

18EI731	Analytical Instrumentation
CO1	Understand the concept and properties of Electromagnetic radiation and to provide various techniques and methods of analysis which occur in the various regions of the spectrum.
CO2	Explain concept on Spectro chemical methods used in analytical instrument application
CO3	Describe the important methods of analysis of infrared Spectroscopy & flame photometry.
CO4	Illustrate the uses of radio chemical methods, Mass and NMR spectroscopy in structure determination.
CO5	Analyse unique methods of separation of closely similar materials, using the most powerful being gas chromatography.

18EI732	Artificial Intelligence in Industrial Automation
CO1	Understand basic AI algorithms.
CO2	Identify appropriate AI methods to solve a given problem.
CO3	Apply the knowledge about AI/ ML/DL techniques in Industrial automation.
CO4	Design appropriate AI methods to solve a given problem.

18EI733	Biomedical Signal Processing
CO1	Model a biomedical system
CO2	Explain various methods of acquiring bio signals
CO3	Analyse physiological signals through digital signal processing techniques
CO4	Simulate the biomedical models and validate its functionality in real time systems.
CO5	Demonstrate the concepts to develop new models that suits current trends of Industries and analyse its performance.

18EI734	Neural Networks & Applications
CO1	Understand the role of neural networks in engineering, artificial intelligence, and

	cognitive modelling.
CO2	Understand the concepts and techniques of neural networks through the study of the most important neural network models.
CO3	Evaluate whether neural networks are appropriate to a particular application.
CO4	Apply neural networks to particular applications, and to know what steps to take to improve performance.

18EI741	Lasers & Optical Instrumentation
CO1	To understand the principles, characteristics and construction of various types of Lasers and Optical fibres
CO2	To apply the basic engineering principles in understanding different type of Laser Instruments.
CO3	To realize the working of optical fibre sensors and detectors for measurement of various parameters
CO4	To analyse the use of optic fiber Instrumentation for a given applications of optical fibre

18EI742	Multimedia Communication
CO1	Understand types of Multimedia networks and applications.
CO2	Illustrate representation of the information of text, images, audio and video.
CO3	Implement the text and image, Audio and Video compression using different techniques and Standards.
CO4	Analyse the various Routing algorithms.
CO5	Evaluate the Broadband Architectures and Transport Protocols.

18EI743	Adaptive Signal Processing
CO1	To classify various Adaptive Systems.
CO2	To evaluate Adaptive Filter Theory & Searching the Performance surface
CO3	To design and develop Steepest Descent Algorithms and develop LMS Algorithm & Applications
CO4	To analyse RLS Algorithm, Statement of Kalman filtering problem, the Innovation Process.

18EI744	Micro Systems and Nanotechnology
CO1	Understand the fundamental knowledge of Microsystems for varied applications
CO2	Understand the working principles of sensors and actuators at micro level
CO3	Integration of various functions into a very small space from sub micro meters to some millimeters and also the fabrication aspects.
CO4	Understand the fundamentals of Nanotechnology.
CO5	Gain knowledge on various synthesis and characterization techniques involved in nano technology.

18EIL76	Process Control and Automation Lab
CO1	Design a suitable signal conditioning circuit for the given physical parameter measured using transducer/sensor
CO2	Calibrate, configure, and tune various real-world instrumentation and control loops on the physical parameters like pressure, temperature, and level training stations.
CO3	Design and develop a ladder diagram using PLC for simple automation application

18EIL77	IoT Lab
CO1	Use microcontroller based embedded platforms in IOT
CO2	Use wireless peripherals for exchange of data.
CO3	Make use of Cloud platform to upload and analyze any sensor data
CO4	Use of Devices, Gateways and Data Management in IoT.
CO5	Use the knowledge and skills acquired during the course to build and test a complete, working IoT system involving prototyping, programming and data analysis.

18EIP78	Project Work Phase-1
CO1	Analyze the problem, formulation and solution of the selected project
CO2	Develop solutions for contemporary problems using modern tools for sustainable development.
CO3	Demonstrate ethical and professional sustainability while working in a team and communicate effectively for the benefit of the society.
CO4	Understand the engineering, finance and management principles

18EII79	Internship
CO1	Understanding the modern tools used in the field of Instrumentation for product development.
CO2	Demonstrate ethical conduct and professional accountability while working in a team for the benefit of society.
CO3	Understand the resources requirement and planning to facilitate the project success

18EIP81	Project Work Phase-2
CO1	Analyze the problem, formulation and solution of the selected project
CO2	Develop solutions for contemporary problems using modern tools for sustainable development.
CO3	Demonstrate ethical and professional sustainability while working in a team and communicate effectively for the benefit of the society.
CO4	Understand the engineering, finance and management principles

18EIS82	Technical Seminar
CO1	Identify recent technical topics from interested domain

CO2	Analyze the applicability of modern software tools & technology
CO3	Develop Presentation and communication skills
CO4	Develop technical report preparation skills

18EII83	Internship
CO1	Understanding the modern tools used in the field of Instrumentation for product development.
CO2	Demonstrate ethical conduct and professional accountability while working in a team for the benefit of society.
CO3	Understand the resources requirement and planning to facilitate the project success