Shri G. S. Institute of Technology and Science, Indore

Department of Electronics and Instrumentation Engineering

CO-PO Articulation Matrix - All Years

B. Tech. (Electronics and Instrumentation Engineering)

Academic Year 2024-25

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
Program Outcomes (PO)
For
B. Tech. (Electronics and Instrumentation Engineering)

PO1:	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2 :	**Problem analysis:** Identify, formulate, review research literature, and analyze Complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3 :	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4 :	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5 :	**Modern tool usage:** Create, select, and apply appropriate techniques, Resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6 :	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7 :	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8 :	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9 :	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10 :	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11 :	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own Work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12 :	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

CO-PO articulation matrix
2nd Year /3rd SEM
Academic Year: 2024-25 Session July-Dec 2024

EI27011: CIRCUIT ANALYSIS AND SYNTHESIS

COURSE OBJECTIVES:

1. To familiarize the students with analysis and Synthesis of Networks and circuits.
2. To develop the basic understanding of various theorems used for analysis of electrical circuits.
3. To equip the students with the concept of time and frequency domain analysis.

COURSE OUTCOMES: After completion of course, the student will be able to:

1. CO1: Apply KVL and KCL in Electrical Circuits.
2. CO2: Identify circuit Topology to reduce complexity.
3. CO3: Apply Fourier series and Laplace transform for circuit analysis and synthesis.
4. CO4: Apply various network topologies to analyzes and synthesis of various electrical parameters (2-port/Hybrid/T/ π)
5. CO5: To perform time domain analysis of electrical networks.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-
CO3	3	2	3	1	-	-	-	-	-	-	-	-
CO4	3	2	3	1	-	-	-	-	-	-	-	-
CO5	3	2	3	1	-	-	-	-	-	-	-	-
Avg.	3	2	2.3	1	-	-	-	-	-	-	-	-

EI27xxx: CIRCUIT ANALYSIS AND SYNTHESIS LAB

LABORATORIES OBJECTIVES:

1. To familiarize the students with basic electrical components and equipment's like CRO, multimeter, power supplies and their use for practical's.
2. To provide an environment to work in groups to perform practical and take readings.
3. To enable the students to record finding and obtain results practically and compare with theoretical results.

LABORATORY OUTCOMES: After completion of lab, the student will be able to:

1. CO1: Apply KVL and KCL in electrical circuit (EXP-1).
2. CO2: Apply Thevenin's/Norton's Theorem to analyze electrical circuits (EXP 2&3).
3. CO3: Apply Superposition Theorem, Reciprocity Theorem and maximum power transfer Theorem (Exp 4, 5 & 6).
4. CO4: Design and implement integrator/ differentiator and verify the functionality of circuits (Exp 7).
5. CO5: Obtain frequency response of series and parallel RLC circuit (with step input and sinusoidal input) & calculate its resonant frequency (EXP 4, 5, 8, 9, & 10).

CO-PO Articulation Matrix for LAB

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	-	-	-	-	-	-	-
CO2	3	3	3	3	3	-	-	-	-	-	-	-
CO3	-	3	2	-	3	-	-	-	-	-	-	-
CO4	--	3	2	3	3	-	-	-	-	-	-	-
CO5	-	3	3	3	-	-	-	-	-	-	-	-
Avg.	3	3	2.6	2.4	2.6	-	-	-	-	-	-	-

EI27012: FUNDAMENTALS OF MEASUREMENT

COURSE OBJECTIVES:

1. To familiarize the students with measuring instruments and their applications.
2. To provide the students with basic knowledge of Analog instruments and their operation.
3. To impart the knowledge of AC and DC bridges for measurement of electrical parameters.

COURSE OUTCOMES: After completion of course, the student will be able to:

1. CO1: To classify measuring instruments and their errors.
2. CO2: Illustrate construction and operations of CRO with its measuring application.
3. CO3: Identify Analog instruments for measuring purposes.
4. CO4: List & explain measurement techniques for resistance, voltage, current/voltage, phase, frequency, energy & power.
5. CO5: Classify A. C. bridges for measurement of electrical parameters like inductance, capacitance.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	2	-	-	-	-	-	-	-	-
CO2	3	2	-	2	1	-	-	-	-	-	-	-
CO3	3	1	-	-	-	-	-	-	-	-	-	-
CO4	3	1	-	1	-	-	-	-	-	-	-	-
CO5	3	1	2	1	-	-	-	-	-	-	-	-
Avg.	3	1.2	2	1.5	1	-	-	-	-	-	-	-

EI27xxx: FUNDAMENTALS OF MEASUREMENT LAB

LABORATORIES OBJECTIVES:

1. To provide the students with hands-on experience in using measuring instruments.
2. To familiarize students with Analog instruments.
3. To encourage students to perform measurement of electrical quantities such as phase, frequency, capacitance, inductance, and resistance.

LABORATORY OUTCOMES: After completion of lab, the student will be able to:

1. CO1: To measure amplitude, phase (Lissajous pattern) & frequency of unknow signal with CRO.
2. CO2: Construct & operationalize Analog instruments based on PMMC principle.
3. CO3: Measure unknown resistance using different methodologies.
4. CO4: Measure unknown Inductance using Maxwell's, Inductance Bridge, Hay's Bridge, Anderson's Bridge, Owen's Bridge.
5. CO5: Measure unknown capacitance using De – Sauty's Bridge, and Schering Bridge

CO-PO Articulation Matrix for LAB

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	3	3	2	3	-	-	-	-	-	-	-
CO2	3	3	3	3	3	-	-	-	-	-	-	-
CO3	3	-	3	2	-	3	-	-	-	-	-	-
CO4	-	3	-	3	3	3	-	-	-	-	-	-
CO5	-	3	3	-	3	-	-	-	--	-	-	--
Avg.	3	3	3	2.5	3	3	-	-	-	-	-	-

EI27013: ELECTRONIC DEVICES AND CIRCUITS

COURSE OBJECTIVES:

1. To expose the students to operating principle of semiconductor devices and circuits.
2. To enable students to build rectifiers, clippers, and amplifier circuits with electronic components.
3. To enable the students to build models of various electronic components.

COURSE OUTCOMES: At end of course, the students should be:

1. CO1: Able to identify the semiconductor type and explain its working principle.
2. CO2: Able to discuss the working principle of diodes/BJT and their applications.
3. CO3: Able to develop the models of diodes & BJT/FET/MOSFET.
4. CO4: Able to explain the principle of operation of MOSFET & its circuit design.
5. CO5: To discuss fabrication techniques for integrated circuits.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	-	-	-	-	-	-	-	-
CO2	3	2	3	2	-	-	-	-	-	-	-	-
CO3	3	3	2	3	-	-	-	-	-	-	-	-
CO4	3	2	2	2	-	-	-	-	-	-	-	-
CO5	3	2	2	3	-	--	-	--	-	--	-	--
Avg.	3	2.2	2.4	2.4	-	-	-	-	-	-	-	-

EI27013: ELECTRONIC DEVICES AND CIRCUITS LAB

LABORATORIES OBJECTIVES:

1. The aim of this laboratory is to give practical exposure to the students on various electronic components, semiconductor devices and electronic instruments which facilitates designing basic electronic circuits and analyze their characteristics.
2. To enable the students to verify characteristics of various electronic components.

LABORATORY OUTCOMES: At end of lab session, the students should be able to:

1. **CO1:** To generate different waveforms using CRO & function generator and to measure parameters like amplitude and frequency.
2. **CO2:** To determine VI characteristics for diodes (PN Junction, LED & Zener)
3. **CO3:** To apply and perform the Hall Effect on semiconductors to identify their types and concentrations.
4. **CO4:** To build, test & obtain the characteristics & parameters of BJT from its input /output variations.
5. **CO5:** To build the circuit and obtain characteristics of N Channel MOSFET

CO-PO Articulation Matrix for LAB

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	1	-	-	-	-	-	-	-
CO2	3	3	2	2	1	-	-	-	-	-	-	-
CO3	3	2	3	2	2	-	-	-	-	-	-	-
CO4	3	2	3	3	2	-	-	-	-	-	-	-
CO5	3	3	2	3	1	-	-	-	-	-	-	-
Avg.	3	2.6	2.6	2.4	1.4	-	-	-	-	-	-	-

EI27016: DIGITAL ELECTRONICS

COURSE OBJECTIVES:

1. To introduce basic concepts and laws involved in Boolean algebra.
2. To familiarize the students with number system and logic gates.
3. To provide the students with the basic knowledge for designing combinational and sequential circuits.

COURSE OUTCOMES: At end of course, the students should be able to:

1. **CO1:** To perform reduction of logical expressions and implement it using logic gate.
2. **CO2:** To develop combinational circuits for given application and verify its operation.
3. **CO3:** To implement the sequential circuits & differentiate with combinational circuits.
4. **CO4:** To analyse memory classification and structure.
5. **CO5:** To implement asynchronous and synchronous circuits fall under digital electronics.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1								1
CO2	3	3	2	1								1
CO3	3	3	2	1								1
CO4	3	2	1	1	2							2
CO5	3	2	1	3	3							2
Avg.	3	2.6	1.6	1.4	2.5							1.4

EI27xxx: DIGITAL ELECTRONICS LAB

LABORATORIES OBJECTIVES:

1. To educate the students on the practical concepts of Digital Electronics and Boolean algebra.
2. To perform rigorous experiments with different types of designs as combinational and sequential logic circuits.
3. To enable the students to implement logic circuits and verify their truth table.

LABORATORY OUTCOMES: At end of lab session, the students should be able to:

1. CO1: Verify truth tables of logic gates & implementation of Boolean logic equations.
2. CO2: Design combinational circuits for given application and verify its operation.
3. CO3: Design, implement and verify the code conversion circuits using logic gates.
4. CO4: Design, implement and verify the sequential logic circuits.
5. CO5: Implement the decoder, multiplexer and counter using TTL ICs and verify their operation.

CO-PO Articulation Matrix for LAB

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	-	-	-	-	-	-	-	-
CO2	3	2	2	1	1	-	-	-	-	-	-	-
CO3	3	3	2	1	1	-	-	-	-	-	-	-
CO4	3	3	2	2	1	-	-	-	-	-	-	-
CO5	3	2	3	2	2	-	-	-	-	-	-	-
Avg.	3	2.6	2.4	1.6	1	-	-	-	-	-	-	-

MA-27014: MATHEMATICS-III

COURSE OBJECTIVES: To enable the students to apply knowledge of Mathematics in various engineering fields by making them:

1. To develop concept of partial differential equations with its applications.
2. To introduce the concept of Fourier series and Fourier transform with their applications.
3. To acquire the knowledge of Laplace transform and its applications in solving ordinary differential equations.
4. To solve the problem related to differential calculus and integral calculus using numerical methods.

COURSE OUTCOMES: After completing the course, the students will be able to:

1. **CO1:** Solve linear homogeneous partial differential equation of n^{th} order & their applications.
2. **CO2:** Obtain Fourier series expansion of function satisfying Dirichlet condition & Fourier transform of elementary function. Also apply concept of Fourier transform in solving linear partial differential equations.
3. **CO3:** Apply concept of Laplace Transform and its techniques to solve second order differential equation involving Dirac delta (Unit impulse).
4. **CO4:** Demonstrate the problems based on interpolation, numerical differentiation & integration.
5. **CO5:** Find the roots of the algebraic, transcendental equations and solve simultaneous equations using various numerical methods.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	-	-	-	-	-	-	-	3
CO2	3	3	3	-	-	-	-	-	-	-	-	3
CO3	3	3	3	-	-	-	-	-	-	-	-	3
CO4	3	3	3	-	-	-	-	-	-	-	-	3
CO5	3	3	3	-	-	-	-	-	-	-	-	3
Avg.	3	3	3	-	-	-	-	-	-	-	-	3

EI27xxx: ELECTRONIC WORKSHOP LAB

LABORATORY OBJECTIVES:

1. Familiarize the students with various Electronics Devices and their specifications.
2. Develop the skills to design and test electronic circuits for various applications.
3. Develop the skills to diagnose faults and their rectification.

LABORATORY OUTCOMES: After completing the lab course, students will be able:

1. CO1: To identify the electronic component and their specifications.
2. CO2: To use electronic instruments for testing electronic components.
3. CO3: To use data sheet to find specifications of electronic components to be used and interpret the data sheet. Specifications.
4. CO4: To draw PCB layout of electronic circuit manually and to perform drilling and etching.
5. CO5: To identify the faults and rectify them to make electronic circuit operational.

CO-PO Articulation Matrix - LAB:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1				1					1
CO2	3											
CO3	3	2	2	1			3					2
CO4	3	2	2	1								2
CO5									3	3	3	
Avg.	3	2	1.67	1			2		3	3	3	1.67

CO-PO articulation Matrix
2nd Year / 4th SEM
Academic Year: 2024-25 Session Jan-June 2025

EI27511: ANALOG ELECTRONICS

COURSE OBJECTIVES:

1. To develop the understanding of amplifiers, coupled amplifiers and their frequency analysis.
2. To introduce the students to the concept of feedback in amplifiers and oscillators.
3. To familiarize the students with Operational amplifiers, Tuned RF amplifiers and multivibrators.

COURSE OUTCOMES: After completion of course, the students will be able to:

1. CO1: To perform the frequency response and gain calculations of single/double stage amplifiers.
2. CO2: To explain principle of feedback amplifier & oscillators.
3. CO3: To analyse and apply OP-Amp fundamentals and Op-amp applications.
4. CO4: To classify & plot frequency response of tuned RF voltage amplifiers.
5. CO5: To describe the operating principle of Multi vibrators & linear wave shaping circuits.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1									
CO2	3	2	1	1								
CO3	3	2	2	2								1
CO4	3	1	1									
CO5	3	2	2	1								1
Avg.	3	1.6	1.4	1.33								1

EI27801: ANALOG ELECTRONICS LAB

LABORATORIES OBJECTIVES:

1. To make students skilled in implementing analog circuits in lab and testing circuits using electronic equipment's like CRO, function generator, multimeter etc.
2. To encourage the students to learn Spice simulator to simulate analog circuits.

LABORATORY OUTCOMES: After completing the lab session, students will be able to:

1. CO1: Plot frequency responses of different RC coupled amplifiers & calculate their parameters.
2. CO2: Plot frequency response of feedback amplifiers & oscillators.
3. CO3: Build the various multi- vibrators & observe their output waveform.
4. CO4: Implement and verify the different applications using Op-Amp.
5. CO5: Plot the frequency response of Tuned amplifiers.

CO-PO Articulation Matrix for LAB

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	3	-	-	-	-	-	-	-
CO2	3	3	2	2	2	-	-	-	-	-	-	-
CO3	3	2	2	2	1	-	-	-	-	-	-	-
CO4	3	2	2	1	1	-	-	-	-	-	-	-
CO5	3	3	1	1	1	-	-	-	-	-	-	-
Avg.	3	2.6	2	1.6	1.6	-	-	-	-	-	-	-

EI27xxx: SENSORS & TRANSDUCERS

COURSE OBJECTIVES:

1. To make the students familiar with construction and working principle of different types of sensors and transducers.
2. To make the students aware of measuring instruments and the methods of measurement.
3. To introduce the students to the concept of selecting the sensors for particular applications.

COURSE COUCOMES: After completing the course, the students will be able to:

1. Identify role of Sensor and transducers in instrumentation.
2. Explain the transducer construction, classification, principle of operation & characteristics.
3. Classify the transducers for measurement of force, pressure, vacuum measurement.
4. Analyze transducers for measurement of temperature.
5. List the transducers for flow and level measurement.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	-	-	-	-	-	-	-
CO2	3	3	2	2	1	-	-	-	-	-	-	-
CO3	3	3	2	2	1	-	-	-	-	-	-	-
CO4	3	2	3	3	1	-	-	-	-	-	-	-
CO5	3	2	3	3	1	-	-	-	-	-	-	-
Avg.	3	2.4	2.4	2.6	1.2	-	-	-	-	-	-	-

EI27xxx: SENSORS & TRANSDUCERS LAB

LABORATORIES OBJECTIVES:

1. Help the students to perform the measurement of various electrical and electronic quantities.
2. To provide practical knowledge of sensor technology, features and characteristics of sensors and their real time applications.
3. Educate the students to select sensors for particular applications.

LABORATORY OUTCOMES: After completion of lab session, students will be able:

1. CO1: To measure the temperature using RTD and other types of transducers.
2. CO2: To calculate the linearity and sensitivity of Strain gauge.
3. CO3: To measure the displacement using LVDT and to investigate behavior of LVDT.
4. CO4: To measure displacement using capacitive type transducer and to find its sensitivity.
5. CO5: To use level sensor for measurement of level.

CO-PO Articulation Matrix for LAB

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	-	-	-	-	-	-	-
CO2	3	3	2	2	3	-	-	-	-	-	-	-
CO3	3	3	3	2	1	-	-	-	-	-	-	-
CO4	3	2	2	3	1	-	-	-	-	-	-	-
CO5	3	2	2	2	1	-	-	-	-	-	-	-
Avg.	3	2.6	2.4	2.2	1.6	-	-	-	-	-	-	-

EI27514: CIRCUIT DESIGN USING HDL

COURSE OBJECTIVES:

1. To impart knowledge of coding the digital logic and circuits in VHDL and Verilog.
2. To familiarize the students with the full custom and semi-custom VLSI design flow.
3. To make aware with the architecture of CPLD, FPGA and other PLDs.

COURSE OUTCOMES: After completion of the course, the student will be able to:

1. **CO1:** Classify various design approaches and interpret Gajeski's chart.
2. **CO2:** Identify the different features & characteristics of VHDL.
3. **CO3:** Design and simulate various combinational & sequential logic circuits using different modelling techniques.
4. **CO4:** Differentiate the VHDL and Verilog for logic design.
5. **CO5:** Classify Programmable logic arrays & devices.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2									
CO2	3	1	1									1
CO3	3	3	1									1
CO4	3	2	1									1
CO5	3	1	1									2
Avg.	3	1.6	1.2									1.25

EI27803: CIRCUIT DESIGN USING HDL LAB

LABORATORIES OBJECTIVES:

1. To familiarize the students with modern CAD tools like Xilinx, Vivado and Modelsim.
2. To provide hands-on practical knowledge of VHDL code writing, simulating and synthesis.
3. To provide hands-on practical knowledge of FPGA boards for downloading VHDL/Verilog code.

LABORATORY OUTCOMES: After completing the lab, the student will be able to:

1. CO1: Design and simulate the combinational circuit like adders and subtractors using VHDL in Vivado flow.
2. CO2: Design and simulate the sequential circuit like flip-flops and counters using VHDL in Vivado flow.
3. CO3: Synthesize the VHDL code in Xilinx tool to obtain the RTL view.
4. CO4: Design, Synthesize and download VHDL code in Artix-7 FPGA boards to verify functionality of logic.
5. CO5: Interface the seven-segment display and keyboard with Artix-7 FPGA boards.

CO-PO Articulation Matrix for LAB

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	1	-	-	-	-	-	-	-
CO2	3	3	3	2	2	-	-	-	-	-	-	-
CO3	3	2	3	3	2	-	-	-	-	-	-	-
CO4	3	2	2	3	1	-	-	-	-	-	-	-
CO5	3	2	2	1	1	-	--	-	--	-	--	--
Avg.	3	2.4	26	2.2	1.4	-	-	-	-	-	-	-

MA-27563: MATHEMATICS-IV

COURSE OBJECTIVES: Enable the students to apply knowledge of Mathematics in various Engineering fields by making them:

1. To introduce the basic theory of complex variables and its applications.
2. To incorporate the knowledge of random variables, its distribution and stochastic process with Markov chain.
3. To utilize the concept of reliability for improving quality of manufacturing components.
4. To present all usual basic concepts of graph theory, graph properties (with simplified proofs) and formulation of typical graph problems.

COURSE OUTCOMES: After completing this course, students will be able to:

1. **CO1:** Solve engineering problems using complex variable techniques such as contour integral & transformation.
2. **CO2:** Apply concept random variables in one and two dimensions and its distribution.
3. **CO3:** Apply concepts stochastic process, Markov chain and their applications.
4. **CO4:** Apply concept of reliability & maintainability for quality improvement in electronics system.
5. **CO5:** Apply concept of graph theory & solve minimal weight & shortest path problems using algorithms.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3									3
CO2	3	3	3									3
CO3	3	3	3									3
CO4	3	3	3									3
CO5	3	3	3									3
Avg.	3	3	3									3

EI27xxx: SOFTWARE WARKSHOP LAB

COURSE OBJECTIVES:

1. To provide a thorough understanding and analysis of signals and systems using MATLAB.
2. To provide the student the enough knowledge of creating and controlling simple plot and user interface graphics objects in MATLAB.

COURSE OUTCOMES: After completion of lab session, the student will be able to:

1. **CO1:** To implement the MATLAB Desktop, Command window and the Graph Window
2. **CO2:** Perform mathematical and logical calculations using MATLAB.
3. **CO3:** Apply and analyse numerical computations.
4. **CO4:** Write script programs using Python/ Perl for various applications.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	3							
CO2	3	2	1	1	2							
CO3	3	2	1	1	2							1
CO4	3	2			3							1
Avg.	3	2.25	1.33	1	2.5							1.5

CO-PO articulation matrix
3rd Year / 5th SEM
Academic Year: 2024-25 Session July-Dec 2024
IT37005: DATA STRUCTURES

COURSE OBJECTIVES: This course intending to provide the knowledge of linear and non-linear data structures and develop skills to apply appropriate data structure in problem solving.

COURSE OUTCOMES: After the completion of course, student will able to:
CO1: Describe various linear and non-linear data structures &analyse algorithms efficiency.
CO2: Solve problems involving graph and tree.
CO3: Apply sorting and searching algorithms to the small and large data sets
CO4: Describe the hash function and concepts of collision and its resolution methods
CO5: Choose appropriate data structures to solve real world problems efficiently.

CO-PO Articulation Matrix (T)

IT37005 (T)												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	2							1
CO2	3	3	2	2								1
CO3	3	2	2									1
CO4	3	2	2									1
CO5	3	3	3	3	2	1						1
Average	3	2.6	2	2.3	2							1

LABORATORIES OBJECTIVES: This laboratory focuses to develop programming skills using different data structures and know the strength and weakness of different data structures.

LABORATORY OUTCOMES: After the completion of laboratory sessions, student will able to,
CO1: Use the appropriate data structure in context of solution of given problem.
CO2: Develop programming skills which require in solving given problem
CO3: Implement and analyze operations on linked list.
CO4: Implement and analyze operations on array.
CO5: develop programming skills to implement different programs corresponding to various sort techniques.

CO-PO Articulation Matrix for LAB

IT37005 (P)												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2	2		3							
CO2		2	2		3							
CO3		3	3		2							2
CO4		3	3		2							2
CO5		3	3		3							2
Average		2.6	2.6		2.6							2

EI37006: MICROPROCESSOR SYSTEMS

COURSE OBJECTIVES: The purpose of this course is to get acquainted with the fundamentals of microprocessor systems.This course focuses to introduce architecture of 16/32 bit microprocessors and design of electronic circuits using microprocessors. It also emphasizes to interface & program various peripherals in microprocessor based circuits.Students will be able to demonstrate programming proficiency using the various addressing modes and data transfer instructions of the target microprocessor.

Course Outcomes: After completion of course, the students will be able to:
CO1: Analyze organization of microprocessors and microcomputers with its architecture and register set.
CO2: Illustrate instruction set of 8085 processor for different applications.
CO3: Interface various I/O devises with 8085 microprocessor and program them.
CO4: Analyze 16 bit microprocessor (8086) and it's working modes
CO5: Analyze ARM processor and different instruction set architectures of microprocessor.

CO-PO Articulation Matrix

EI37006 Microprocessor systems (T)												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											2
CO2	3				2							
CO3	3	2	2		2							3
CO4	3				1							2
CO5	3	1	1		1							2
Average	3	1.5	1.5		1.5							2.25

EI37xxx: MICROPROCESSOR SYSTEMS LAB

LABORATORIES OBJECTIVES: The Microprocessor and operating systems Laboratory is designed:
1. To develop programs to implement algorithms of engineering problems.
2. In this lab, students are expected to get hands-on experience in using hardware and software simulators for 8085.
3. To develop communication skill through laboratory note book with written descriptions of code, flowchart and results.
4. To get exposure for various interfacing techniques.

LABORATORY OUTCOMES: After the completion of laboratory schedule, student will able to:
CO1: Develop capability for designing and documenting simple programs to implement algorithms of engineering problems. (Trainer kit-M85-03)
CO2: Design &Analyze an interfacing of microprocessor with various peripherals devices.
CO3: Illustrate various industrial applications of microprocessor in the real world.
CO4: Develop professional journal writing & presentation to discuss the progress of the project.

CO-PO Articulation Matrix

EI37006 Microprocessor systems (P)												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2	3		2							2
CO2		2	3		2							2
CO3												2
CO4									1	3		1
Average		2	3		2							1.75

EI37xxx: CMOS VLSI DESIGN

COURSE OBJECTIVES: This course focuses on

1. To nurture the students with CMOS digital logic design.
2. To provide the students with the knowledge of trade-off between speed, power and area in CMOS digital VLSI design.
3. To provide enough knowledge to students for digital logic design with FSM.

COURSE OUTCOMES: After completing the subject student will be able to:

1. **CO1:** Explain importance of MOS transistor in designing VLSI circuits.
2. **CO2:** Implement and analyse CMOS Inverter for static & dynamic characteristics.
3. **CO3:** Design and analyse Dynamic and Domino logic.
4. **CO4:** Design FSM using Mealy and Moore machines.
5. **CO5:** Classify memory systems and differentiate between custom and semi-custom design.

CO-PO Articulation Matrix for Theory

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	2	3	-	-	-	-	-	-	-
CO3	3	3	-	2	2	-	-	-	-	-	-	-
CO4	3	2	2	2	3	-	-	-	-	-	-	-
CO5	3	3	2	2	2	-	-	-	-	-	-	-
Avg.	3	2.2	2	2	2.5	-	-	-	-	-	-	-

EI37xxx: CMOS VLSI DESIGN LAB

LABORATORIES OBJECTIVES:

1. Demonstrate the ability to use Cadence EDA tool for CMOS circuit design.
2. Students will be given hands-on of Virtuoso schematic and layout of CMOS circuits.
3. Students will be provided with a hands-on Spectre simulator for simulation and Assura for physical verification (DRC, LVS, and RCX) of CMOS circuits.

LABORATORY OUTCOMES: On completion of lab course, the student will be able to: CO1: Able to use the Cadence EDA tools for CMOS circuits design.
CO2: Design CMOS logic circuits using Virtuoso Schematic editor of Cadence.
CO3: Able to use Spectre simulator to analyze functional and timings of logic circuits. CO4: Design the layout of CMOS circuits using Virtuoso layout editor tool.
CO5: Demonstrate the use of Assura tool for physical verification of layout.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	-	-	-	-	-	-	-	-	-
CO2	3	2	3	2	1	-	-	-	-	-	-	-
CO3	3	3	2	2	2	-	-	-	-	-	-	-
CO4	3	2	2	2	1	-	-	-	-	-	-	-
CO5	3	3	2	2	2	-	-	-	-	-	-	-
Avg.	3	2.4	2.4	2	1.2	-	-	-	-	-	-	-

EI 37481: TEST & CALIBRATION LAB

LABORATORY OBJECTIVES: This laboratory session are aimed to give the wide description to analyze different methods of calibration in systems. It also focuses to classify and rectify the source of error in measurement systems.

LABORATORY OUTCOMES: After the completion of course, student should able to:

1. CO1: Measure static and dynamic characteristic in measurement system
2. CO2: Discuss concepts of testing of measuring Equipment.
3. CO3: Describe and analyze the errors in electronic equipment and systems.
4. CO4: Calibrate test equipment.
5. CO5: Implement linearization techniques to eliminate the errors in system

CO-PO Articulation Matrix

Test & Calibration EI37481												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										1
CO2	3	2										2
CO3	3	2	2	3								2
CO4	3	2	2	3								2
CO5	3	2	2	3								2
Average	3	2										1.8

EI 37482: INTERNSHIP EVALUATION-I

COURSE OBJECTIVES: This internship will acts as bridge between theoretical backgrounds to current scenario of industrial works. It emphasizes to develop following four major aspects in an intern:

1. Skill development
2. Understanding real world applications
3. Career awareness
4. Personal development

COURSE OUTCOMES: After the completion of internship, student will be able to:

1. CO1: Explore career alternatives prior to graduation.
2. CO2: Develop work habits and attitudes necessary for job success.
3. CO3: Identify, write down, and carry out performance objectives
4. CO4: Develop communication, interpersonal and other critical skills in the job interview process.
5. CO5: Asses their strength, weakness and opportunity in the selected industry

CO-PO Articulation Matrix

Internship Evaluation-I EI37482												
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3											3
CO2		3										3
CO3									2	3		3
CO4									1	3	2	3
CO5												3
Average	3	3							1.5	3	2	3

PROGRAM ELECTIVE I

1	ECXXX	Analog & Digital Communication
2	EIXXX	Smart Sensors
3	EIXXX	Peripherals & Interfacing

EC 37xxx: ANALOG & DIGITAL COMMUNICATION

COURSE OBJECTIVES: The goal of this course is to introduce basic principles of Continuous wave (CW) Modulation, Pulse Modulation, as required for Electronics engineering students. The course aims to make the student familiar with Digital Communication, transmission & reception etc.

COURSE OUTCOMES: After the completion of this course, student will able to, CO1: Compare & contrast different signals & variables used in communication **CO2:** Apply & analyze amplitude modulation in communication system.
CO3: Compare & analyze different angle modulation schemes for their efficiency and bandwidth
CO4: Analyze the behavior of a communication transmitter/ receiver system module.
CO5: Analyze different digital modulation schemes, digital receiver system module.

CO-PO Articulation Matrix

EC37014 (T)												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		1									3
CO2	3		2									
CO3	3		2									
CO4	3		2									2
CO5	3		2									3
Average	3		1.8									2.67

EI 37255: SMART SENSORS

COURSE OBJECTIVES: The subject focuses on the sensors used in instrumentation engineering. It aims in developing understanding of sensors design, classification, communication and intelligent sensors.

COURSE OUTCOMES: At the end of the course he student will be able to:

1. CO1. Analyze the concept of principle of operation of different sensors and their applications.
2. CO2. Analyze different Electro analytical sensors.
3. CO3. Compare and Contrast various wireless sensor network
4. CO4 Develop the logics about establishment of intelligent sensoring system
5. CO5. Evaluate design and modelling issue using complex engineering mathematics

CO-PO Articulation Matrix

EI 37255 (T)												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1										2
CO2	3	1										2
CO3	3	1	1									2
CO4	3	2	2									3
CO5	3	2	2	2								3
Average	3	1.4	1.67	2								2.4

EI 37xxx: PERIPHERALS & INTERFACING

COURSE OBJECTIVES: The objective of this course is to provide deep understanding of computer architectures and organisation of memory in to them. Further it focused on interfacing cables between instruments and computer systems with applicable standards.

COURSE OUTCOMES: After the completion of this course, the student will able to:

CO1: Discuss architecture of computer systems for Uni-processing and parallel processing.
CO2: Apply the concept of memory systems like cache & virtual memory on memory segmentation.
CO3: Illustrate the construction & working principle of floppy disk controller & CRT controller. CO4: Develop ability to identify specific peripherals related to computer system.
CO5. Describe the concept of applying memory organisation in computer systems.

CO-PO Articulation Matrix

Peripherals & Interfacing EI37xxx												
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3											
CO2	3											
CO3	3											1
CO4	3	2	2									1
CO5	3	2	2									1
Average	3	2	2									1

OPEN ELECTIVE I

1	IP 37251	Industrial Engineering & Management
2	CO 37253	Artificial Intelligence

IP 37251: INDUSTRIAL ENGINEERING & MANAGEMENT

COURSE OBJECTIVES: This course introduces the concept of management and organizational structure. It further emphasizes on operational management techniques & quantitative and quality control strategies. Also it aims on:

1. To gain knowledge on work-study and allowances in work management.
2. To understand workplace designs.

COURSE OUTCOMES: After the completion of course, student will able to:

1. CO1: Identify work place design, work measurement tests & technology.
2. CO2: Apply the concept of operations & organization management.
3. CO3: Describe principles & structure of organization & personal management techniques.
4. CO4: Apply quantitative techniques: operational research, linear programming and transportation model for decision making.
5. CO5: Analyse & apply operations and economics for quality control.

CO-PO Articulation Matrix

Industrial Production & Management IP37251												
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3											
CO2	3		2									
CO3	3	2	2									2
CO4	3	2	2									2
CO5	3	2	2									2
Average	3	2	2									2

CO 37253: ARTIFICIAL INTELLIGENCE

COURSE OBJECTIVES: The main learning objectives of the course are to:

1. Identify problems where artificial intelligence techniques are applicable.
2. Apply selected basic AI techniques; judge applicability of more advanced techniques.
3. Participate in the design of systems that act intelligently and learn from experience

COURSE OUTCOMES: After the completion of the course, the student will able to:

1. CO1: Differentiate between Human and Artificial Intelligence.
2. CO2: Apply knowledge representation using logic and rules and reasoning.
3. CO3: Describe the basic of machine learning and performance parameters.
4. CO4: Elaborate the principle and application of regression and SVM and practice the training using the said method.
5. CO5: Classify and examine the process of decision trees and dimensionality reduction in Machine learning.

CO-PO Articulation Matrix

Artificial Intelligence CO37253												
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1									
CO2	2	1	2	1								
CO3	3	2	2	1								1
CO4	3	2	1	1								1
CO5	2	2	2	2								1
Average	2.6	1.8	1.6	1.25								

CO-PO articulation matrix
3rd Year / 6th SEM
Academic Year: 2024-25 Session Jan-June 2025

EI37511: FILTER DESIGN AND SIMULATION

COURSE OBJECTIVES: This course aims to familiarize student with the concept of analog filter design, passive filters, RC active filters and switched-capacitor filters. It further focuses on realization techniques in synthesis process of filters.

COURSE OUTCOMES: After the completion of this course, student will able to,
CO1: Analyze frequency response & plot Bode plot using design equations for various filters.
CO2: Compare and contrast Elliptical, Butterworth, chebyshev and Cauer filters using approximation theory.
CO3: Realize Butterworth filters up-to second order using Op-amp.
CO4: Analyse active networks using different approaches.
CO5: Design & Realize LC ladder, Kerwins circuit and other passive filter circuits

CO-PO Articulation Matrix

Filter Design and Simulation EI37511												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2									2
CO2	2	3	2									2
CO3	3	2	3									2
CO4	2	2	3									1
CO5	2	2	1									1
Average	2.4	2.2	2.2									1.6

EI37xxx: FILTER DESIGN AND SIMULATION LAB

LABORATORIES OBJECTIVES: This lab introduces filter design of various active filters & provide deeper understanding of the filter realization techniques. This also introduces hardware implementation of the filtering techniques.

LABORATORY OUTCOMES: after the completion of this laboratory sessions, Student will able to design, realize and verify frequency response of
CO1: Butterworth Low Pass & High pass filters, Band Pass & All pass filters
CO2: Butterworth Second order Low Pass & High pass filters
CO3: Butterworth Notch and band Reject Filters
CO4: Chebyshev 2nd order Low pass & other various filter topologies
CO5: To develop the meaning from oral, written, and graphical plotting through the experiments.

CO-PO Articulation Matrix for LAB

Filter Design and Simulation EI37511 (P)												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1						1			2
CO2	3	1	1						1			2
CO3	3	1	1						1			2
CO4	3	2	1						1			2
CO5									3	3		2
Average	3	1.25	1						1.4	3		2

EI37xxx: MICROCONTROLLER & EMBEDDED SYSTEMS

COURSE OBJECTIVES: The student will able to:

1. To analyze the basic concepts and architecture associated with different microcontrollers families and embedded systems.
2. To design assembly language programs for Different scenarios and calculations.
3. To illustrate interfacing of different I/O devises with 8051 microcontroller

COURSE OUTCOMES: After the completion of this course, the student will able to:

1. CO 1: Analyze the basic concepts and architecture associated with microcontrollers family
2. CO 2: Design assembly language programs for different scenarios and calculations.
3. CO 3: Design of microcontroller (8051) based system by interfacing various types of I/O devices.
4. CO 4: Analyze the Hardware Architecture of embedded system, by using few case studies.
5. CO5: Compare various software architecture of embedded systems and RTOs.

CO-PO Articulation Matrix

Microcontroller & Embedded Systems EI37xxx (T)												
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3											
CO2	3	3	2									3
CO3	3	3	2									3
CO4	3											2
CO5	3	2	1									2
Average	3	2.67	1.67									2.5

EI37xxx: MICROCONTROLLER & EMBEDDED SYSTEMS LAB

1. **LABORATORIES OBJECTIVES:** To develop programs to implement algorithms of engineering problems using microcontrollers.
2. In this lab, students are expected to get hands-on experience on simulator for solving stated programs.
3. To get exposure for various interfacing techniques using simulator.

LABORATORY OUTCOMES: After the completion of this laboratory sessions, student will able to:

1. CO1: Design Assembly language program (or C language) using Arithmetic, logical instructions using Keil software
2. CO2: Evaluate delay for various operations and write assembly language program (or C language) for 8051 using Keil software.
3. CO3: Interfacing of various devises using Keil and Proteous software.
4. CO4: To develop communication skill through laboratory note book with written descriptions of code, flowchart and results.

CO-PO Articulation Matrix for LAB

Microcontroller & Embedded Systems EI37xxx (P)												
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	2		3							
CO2	3	2	2	2	3							2
CO3	3	3	2	2	3							2
CO4	2								3	3		1
Average	2.75	2.33	2	2	3				3	3		1.67

EE37xxx: CONTROL SYSTEM

COURSE OBJECTIVES: This course focuses on

1. Mathematical tools to develop control systems model, time and frequency responses of dynamical systems, performance specifications.
2. Techniques for determining stability of systems.
3. Basic design aspects of various controllers and compensators.
4. Dynamical system analysis using state space model..

COURSE OUTCOMES: After completing the subject student will be able to:

EE32009(T).1: Develop mathematics models (TF and state space) of various physical systems. EE32009(T).2: Define time domain and frequency domain specifications of a control system. EE32009(T).3: Determine stability of a control system using time domain techniques and design appropriate controller for a given problem.

EE32009(T).4: Propose alternate solution via compensator design to get desired frequency domain specifications.

EE32009(T).5: Explain concepts of controllability and observability as well design of state feedback controller.

CO-PO Articulation Matrix for Theory

EE37xxx Control System (T)												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1							
CO2	3	3	2	2								
CO3	3	3	2	2	1							
CO4	3		2	2	1							
CO5	3	3			1							
Average	3	3	2	2	1							

EE37xxx: CONTROL SYSTEM LAB

LABORATORIESOBJECTIVES:

1. Students will be able to use the laboratory techniques, tools and practices of control engineering.
2. To families with the modeling of dynamical system and the characteristics of control components like servo motor, synchros.
3. To understand time and frequency responses of control system with and without controllers and compensators.
4. To simulate and analyse the stability using MATLAB software and design the compensators.

LABORATORY OUTCOMES:

1. CO1: Develop professional quality systems, textual and graphical tools to obtain the results in obtaining the expected data analysis.
2. CO2: Evaluate the error and compare different error detectors, according to their performance requirement in control systems.
3. CO3: Determine the performance characteristics and speed control of various servo motors.
4. CO4: To create the optimal results by using different types of controller for systems of first and second order system.
5. CO5: Make use of standard inputs for steady state error analysis via IT tools.

CO-PO Articulation Matrix for LAB

EE37xxx Control System (P)												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1				1		1	1
CO2	3		2									
CO3	3	3	2	2								
CO4	3	3		2	1					1		
CO5	3	3			1				1	1	1	1
Average	3	3	2	2	1				1	1	1	1

EI37991: MINI PROJECT

COURSE OBJECTIVES: The student will able to implement & verify functionality of microcontroller based projects. Further it incorporates:

1. To plan for various activities of the project and distribute the work amongst team members.
2. To inculcate electronic hardware implementation skills by –
   - Learning PCB artwork design using an appropriate EDA tool.
   - Imbibing good soldering and effective trouble-shooting practices.
   - Following correct grounding and shielding practices.
3. To develop student‘s abilities to transmit technical information clearly and test the same by delivery of Presentation based on the Mini Project.
4. To understand the importance of document design by compiling Technical Report on the Mini Project work carried out.

COURSE OUTCOMES: After the completion of this laboratory schedules, the students will able to:

1. CO1: Plan, Structure and execute a Mini Project with team.
2. CO2: To interpret data sheets & specifications of various logic families & IC‘s
3. CO3: Implement electronic hardware by interfacing sensors with controllers, learning PCB artwork design, soldering techniques, testing and troubleshooting etc.
4. CO4: Deliver technical presentational based on the Mini Project work carried out
5. CO5: Prepare a technical report based on the Mini project.

CO-PO Articulation Matrix

Mini Project EI37991												
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	3	2	3		1		2		3	3
CO2	3	2	3	2	3		1		2		3	3
CO3	3	2	3	2	3	3	1		2		3	3
CO4	1								2		3	2
CO5	1								2	3	3	2
Average	2.2	2	3	2	3	3	1		2	3	3	2.6

PROGRAM ELECTIVE II

1	**EI37XXX**	**High Frequency Engineering**
2	**EI37XXX**	**Analog Integrated Circuits**
3	**EI37XXX**	**Analytical Instrumentation**

EI37xxx: HIGH FREQUENCY ENGINEERING

COURSE OBJECTIVES: The main objectives of the course are to:

1. Introduce students to a physical understanding of the main principles and fundamental laws on which electromagnetic wave propagation is based.
2. Introduce the concept of transmission line and provide the tools (Smith Chart) that can be used for solution of such problems.
3. Provide the deep understanding of wave propagation inside the waveguide including reference to cavity resonator.

COURSE OUTCOMES: After completing the course, the students will be able to:

1. **CO1:** To interpret and apply Maxwell's equation & wave equation for RF circuits.
2. **CO2:** To differentiate lossy, lossless and distortion less transmission lines.
3. **CO3:** To apply concept of impedance matching in transmission line.
4. **CO4:** Classify the waveguides and their modes of excitation.
5. **CO5:** To discuss working principle and operation of high frequency components like Magnetron, Klystron & TWT.

CO-PO Articulation Matrix

High Frequency Engineering EI37513 (T)												
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	2								
CO2	3	3	2	2								
CO3	3	2	2	1								
CO4	3	2	1	1								
CO5	3	2	1	1								
Average	3	2.4	1.8	1.4								

EI37xxx: ANALOG INTEGRATED CIRCUITS

COURSE OBJECTIVES:

1. To prepare the students to gain understanding of CMOS Analog circuits and Systems.
2. To make students familiar with Analog circuit analysis and simulation tool flow.
3. To prepare students to tackle advanced analog IC topics like Op-amp, PLL, ADC, DAC, VCO etc.

COURSE OUTCOMES: After completion of course, student will be able to:

1. CO1: Identify and compare the topologies for CMOS amplifier design.
2. CO2: Design and Analyze CMSO differential amplifiers with various loads.
3. CO3: Design and Analyse various feedback amplifiers.

4. CO4: Design CMOS single stage op-amp, two stage op-amp for various performance parameters like slew rate, CMRR, gain, etc.
5. CO5: Design CMOS Op-amp comparators, regenerative and high-speed comparators.

CO-PO Articulation Matrix

EI37xxx: ANALOG INTEGRATED CIRCUITS												
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	1	2							
CO2	3	3	2	1	2							
CO3	2	2	2									
CO4	2			2	2							
CO5			1	2	2							
Average	2	1.6	1.4	1.2	1.6							

EI37704: ANALYTICAL INSTRUMENTATION

COURSE OBJECTIVES: This course intending to provide the knowledge of industrial instrumentation i.e. how the machines & instruments work for the industries dealing in pharmacy, mechanical/Production etc.

COURSE OUTCOMES: After the completion of course, student will able to:

1. CO1: Analyse methods &Techniques for various colorimetric & spectrometry
2. CO2: Compare & Contrast unique methods of separation of closely similar materials through chromatography
3. CO3: Describe important methods of analysis of industrial gases. Awareness and control of pollution in the environment is of vital importance.
4. CO4: Describe different pH meters & their measurement methods.
5. CO5: Choose appropriate Electro Magnetic Resonance & Microscopic Techniques for NMR.

CO-PO Articulation Matrix (T)

EI37704												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										1
CO2	3	3										1
CO3	3	2	2									1
CO4	3	2	2									1
CO5	3	3	2									1
Average	3	2.6	2									1

OPEN ELECTIVE II

1	**IT37XXX**	**Web Engineering**	**IT Board**
2	**EC37XXX**	**Mobile Communication**	**EC Board**
3	**EC37XXX**	**Digital Signal Processing**	**EC Board**

EC37xxx: DIGITAL SIGNAL PROCESSING

COURSE OBJECTIVES: This course emphasizes on:
1. Identification of the type signals and systems.
2. How to apply the principles of discrete-time signal analysis to perform various signal operations.
3. Applying z-transforms to finite difference equations.
4. Fourier transform to describe the frequency characteristics of discrete-time signals and systems.
5. Necessity principles of signal analysis to filtering.

COURSE OUTCOMES: After completing this course, the student will be able to:
CO1: Compare & contrast various kinds of signals, their properties and significance.
CO2: Evaluation of System functions and frequency response by using Z-Transforms.
CO3: Design Digital FIR filters using window techniques, Fourier methods and frequency sampling techniques.
CO4: Design Digital filters from analog filters using various techniques.
CO5: Develop Fast Fourier Transform (FFT) algorithms for faster realization of signals and systems.

CO-PO Articulation Matrix

Digital signal Processing EC37xxx/37xxx (T)												
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3											1
CO2	3											3
CO3	3	2										2
CO4	3	2	2									2
CO5	3	2	2									2
Average	3	2	2									2

CO-PO articulation Matrix
4th Year / 7th SEM
Academic Year: 2024-25 Session July-Dec 2024

EI47053: PROCESS INSTRUMENTATION

COURSE OBJECTIVES: The purpose of this course is to

1. Apply key concepts of automatic control and instrumentation to process plants.
2. Expose the students to the advanced control methods used in industries and research.
3. Familiarize the students with PID tuning and PLC ladder diagram used in process plants.

COURSE OUTCOMES: After completion of course, the students should be able to:

1. **CO1:** Analyse process control system and evaluation.
2. **CO2:** Explain the application of pneumatic, hydraulic & controller in control systems.
3. **CO3:** To describe PLC and ladder programming for designing various logics.
4. **CO4:** To discuss final control elements.
5. **CO5:** To employ PLC and ladder programming to real world scenario.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	-	1	-	-	-	-	1
CO2	3	2	1	3	2	-	-	-	-	-	-	2
CO3	3	1	2	2	1	-	-	-	-	-	-	2
CO4	3	2	1	1	1	-	-	-	-	-	-	-
CO5	3	2	1	2	3	-	1	-	-	-	-	2
Avg.	3	1.8	1.4	2	1.8	-	1	-	-	-	-	1.75

EI47053: PROCESS INSTRUMENTATION LAB

LABORATORIES OBJECTIVES:

1. To familiarize the students with the measurement and control of various process loops like flow, level, temperature etc.
2. To provide hands-on experimentation of PID controller tuning for various parameters.
3. To enable the student to gain knowledge of ladder programming with PLC.

LABORATORY OUTCOMES: After completing the lab session, **t**he student will be able to:

1. CO1: Analyse pressure-displacement characteristics of Flapper-Nozzle system.
2. CO2: Perform the measurement and control of flow, level and temperature loops using PID controller.
3. CO3: Analyse the cascade control loop of Flow-level.
4. CO4: Analyse the feedback pressure control loop.
5. CO5: Design the ladder diagram for PLC based lift elevator, bottle filling system.

CO-PO Articulation Matrix for LAB

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	-	-	-	-	-	-	-
CO2	3	3	2	2	2	-	-	-	-	-	-	-
CO3	3	2	2	2	1	-	-	-	-	-	-	-
CO4	3	2	2	1	1	-	-	-	-	-	-	-
CO5	3	2	2	1	1	-	--	-	--	-	--	--
Avg.	3	2.4	2.2	1.6	1.4	-	-	-	-	-	-	-

EE47002: POWER ELECTRONICS

COURSE OBJECTIVES:

1. To provide students a deep insight into the operational behaviour of practical power switching devices with respect to their static and dynamic characteristics.
2. To learn the working principle of classified topologies of Thyristor based AC/DC, AC/AC, DC/DC and DC/AC converters.
3. To design and analyse the operation of above converters considering their applications.
4. To understand design of firing circuits for Thyristor based line commutated converters.

COURSE OUTCOMES:

1. **CO1:** EE47002(T).1: Acquire knowledge about fundamental concepts and switches used in power electronics.
2. **CO2:** EE47002(T).2: Ability to analyse various single phase and three phase line commutated power converter circuits and understand their applications.
3. **CO3:** EE47002(T).3: Nurture the ability to identify basic requirements for line commutated converter-based design application.
4. **CO4:** EE47002(T).4: To develop skills to build and troubleshoot power electronics circuits.
5. **CO5:** EE47002(T).5: Understand the firing circuit design for line commutated converters.
6. **CO6:** EE47002(T).6: Foster ability to understand the use of line commutated converters in professional engineering.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	1	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	3	3	-	-	-	-	-	-	-	-	-
CO5	3	3	3	-	-	-	-	-	-	-	-	-
Avg.	3	3	3	1	-	-	-	-	-	-	-	-

EE47002: POWER ELECTRONICS LAB

LABORATORIES OBJECTIVES: Following are the objective of the course:

1. Show awareness about operating behaviour of various static switches used in converters.
2. Understand the basic requirements in design of power converters.
3. Analyse performance parameters of various power converters.

LABORATORY OUTCOMES: Students will be able to:

1. **CO1:** EE42007 (P).1: Recognize the functions of CRO, identify and select proper instruments to observe and record performance on different experimental set ups of power electronics laboratory.
2. **CO2:** EE42007 (P).2: Establish wiring and device connections to assemble experiments of static switches, line commutated, DC-DC converters and record their performances.
3. **CO3:** EE42007 (P).3: Analyse and compare the performance of various firing pulse generation circuits for triggering and Commutation circuit of SCR.
4. **CO4:** EE42007 (P).4: Apply professional quality textual and graphical tools to sketch and computing results, incorporating accepted data analysis and synthesis methods, mathematical software, and word- processing tools.
5. **CO5:** EE42007 (P).5: Ability to work in individual and in group following engineering practices. Ability to interact effectively on a social and interpersonal level, divide up and share task responsibilities to complete assignments.

CO-PO Articulation Matrix for LAB

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	3	3	3	-	3	3	2	-	-
CO2	3	-	3	3	3	3	-	3	3		-	-
CO3	3	2	-	3	3	3	-	3	3	2	-	-
CO4	3	2	3	3	3	3	-	3	3	2	-	-
CO5	3	-	-	3	3	3	-	3	3	-	-	-
Avg.	3	2	3	3	3	3	-	3	3	2	-	-

EI47055: VLSI DESIGN

COURSE OBJECTIVES:

1. To nurture the students with CMOS digital logic design.
2. To provide the students with the knowledge of trade-off between speed, power and area in CMOS digital VLSI design.
3. To provide enough knowledge to students for digital logic design with FSM.

COURSE OUTCOMES: After completion of course, the student will be able to:

1. **CO1:** Explain importance of MOS transistor in designing VLSI circuits.
2. **CO2:** Implement and analyse CMOS Inverter for static & dynamic characteristics.
3. **CO3:** Design and analyse Dynamic and Domino logic.
4. **CO4:** Design FSM using Mealy and Moore machines.
5. **CO5:** Classify memory systems and differentiate between custom and semi-custom design.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	2	3	-	-	-	-	-	-	-
CO3	3	3	-	2	2	-	-	-	-	-	-	-
CO4	3	2	2	2	3	-	-	-	-	-	-	-
CO5	3	3	2	2	2	-	-	-	-	-	-	-
Avg.	3	2.2	2	2	2.5	-	-	-	-	-	-	-

EI47055: VLSI DESIGN LAB

LABORATORIES OBJECTIVES:

1. Demonstrate the ability to use Cadence EDA tool for CMOS circuit design.
2. Students will be given hands-on of Virtuoso schematic and layout of CMOS circuits.
3. Students will be provided with a hands-on Spectre simulator for simulation and Assura for physical verification (DRC, LVS, and RCX) of CMOS circuits.

LABORATORY OUTCOMES: On completion of lab course, the student will be able to:

CO1: Able to use the Cadence EDA tools for CMOS circuits design.

CO2: Design CMOS logic circuits using Virtuoso Schematic editor of Cadence.

CO3: Able to use Spectre simulator to analyze functional and timings of logic circuits. CO4: Design the layout of CMOS circuits using Virtuoso layout editor tool.

CO5: Demonstrate the use of Assura tool for physical verification of layout.

CO-PO Articulation Matrix for LAB

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	-	-	-	-	-	-	-	-	-
CO2	3	2	3	2	1	-	-	-	-	-	-	-
CO3	3	3	2	2	2	-	-	-	-	-	-	-
CO4	3	2	2	2	1	-	-	-	-	-	-	-
CO5	3	3	2	2	2	-	-	-	-	-	-	-
Avg.	3	2.4	2.4	2	1.2	-	-	-	-	-	-	-

EI-47257: FIBER OPTICS & PHOTONICS (Elective-III)

COURSE OBJECTIVES:

1. To introduce the students to various optical fiber modes and configurations.
2. To provide the essential knowledge of fiber optic communication system.
3. To impart the knowledge of optical sensors, materials for various applications.

COURSE OUTCOMES: After completion of course, the student will be able to:

1. **CO1:** To identify modes in optical fibres and define attenuation dispersion optical fibres and also identify numerical aperture measurement techniques.
2. **CO2:** To classify various Optical sensors for measurement of parameters like temperature, flow etc.
3. **CO3:** To design and implement fibre optic communication system for desired BER, link & power budget and time budget.
4. **CO4:** To classify optoelectronics materials & their characteristics required for photonics integrated circuits.
5. **CO5:** Identify the behaviour and functionality of different optoelectronic devices.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	-	-	-	-	-		1
CO2	3	2	1	-	-	-	-	-	-	-		2
CO3	2	2	3	-	-	-	-	-	-	-		3
CO4	2	1	3	-	-	-	-	-	-	-		1
CO5	3	1	2									1
Avg.	2.6	1.8	2.2									1.6

IT47201: DATA STRUCTURES (Program Elective-III)

COURSE OBJECTIVES:

1. To make the students to understand data structure stack queues, lists, trees, complexity etc. in detail.
2. Study memory hierarchy, management techniques partitioning, segmentation, paging and comparison of techniques.

COURSE OUTCOMES: After completing the course, the student should be able to:

1. **CO1:** Define the data structure & solve problems involving stack queues, lists, trees.
2. **CO2:** Explain the concept of memory hierarchy, management techniques partitioning, segmentation, paging and comparison of techniques.
3. **CO3:** Explain the CPU scheduling and multiprogramming.
4. **CO4:** List the file systems and its organization.
5. **CO5:** Case studies on MS-DOS, UNIX and WINDOWS NT.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	-	-	-	-	1
CO2	3	3	1	2	2	-	-	-	-	-	-	1
CO3	3	3	2	2	-	-	-	-	-	-	-	1
CO4	3	2	2	-	-	-	-	-	-	-	-	1
CO5	3	2	2	-	-	-	-	-	-	-	-	1
Avg.	3	2.4	1.6	2	2							1

EI47322: (PROGRAM ELECTIVE-IV) VLSI TECHNOLOGY

COURSE OBJECTIVES:

1. To provide the students the in-depth knowledge of steps involved in chip fabrication processes.
2. To encourage the students to learn about wafer preparation, oxidation and ion implantation and photolithography.

COURSE OUTCOMES:

1. **CO1:** To describe crystal growth and wafer preparation methods.
2. **CO2:** To list different layering & oxidation methods in terms of chip fabrication.
3. **CO3:** To illustrate various patterning and doping methods.
4. **CO4:** To design Floor-planning using EDA tools along with layout design rules check and stick diagrams.
5. **CO5:** To discuss various subsystem design and memories.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	1	-	-	-	-	-	-	-
CO2	3	2	2	1	1	-	-	-	-	-	-	1
CO3	3	2	3	2	1	-	-	-	-	-	-	1
CO4	3	2	3	1	1	-	-	-	-	-	-	2
CO5	3	3	2	2	1	-	-	-	-	-	-	2
Avg.	3	2.2	2.4	1.4	1	-	-	-	-	-	-	1.5

EI-47301: (PROGRAM ELECTIVE-IV) INTELLIGENT INSTRUMENTATION

COURSE OBJECTIVES:

1. To make students acquire the knowledge of robotics and its mechanism.
2. To acquaint students with software and technical equipment of intelligent instrumentation, its internal structures and properties.
3. To familiarize the students with artificial intelligence required in Instrumentation.

COURSE OUTCOMES: After completion of course, the student will be able to:

1. **CO1:** Realization of concepts of robotics, robot mechanism and its functional analysis.
2. **CO2:** Design the smart systems and analyse in terms of interfacing and intelligent instrumentation.
3. **CO3:** Establish the real time systems and its scheduling.
4. **CO4:** Evaluate the expert system for real time control applications.
5. **CO5:** Analyse artificial intelligence and its requirement in instrumentation

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	1	2	-	-	-	-	-	-	-
CO2	2	2	3	1	2	-	-	-	-	-	-	-
CO3	2	2	3	2	1	-	-	-	-	-	-	-
CO4	3	3	3	1	1	-	-	-	-	-	-	-
CO5	3	3	2	2	1	-	-	-	-	-	-	-
Avg.	2.6	2.6	2.8	1.4	1.4	-	-	-	-	-	-	-

EI47499 (AB-Group): MAJOR PROJECT PHASE-I

COURSE OBJECTIVES:

1. To provide the students with opportunity to apply the skills and knowledge acquired in their courses to a specific problem.
2. To allow the students to extend their academic experience into areas of interest and working with new idea.
3. To take on the challenges of teamwork, prepare a presentation in a professional manner and document all aspects of work.

COURSE OUTCOMES: After completing the Project Phase-I, students will be able to:

1. **CO1:** Demonstrate a sound technical knowledge of their selected project topic.
2. **CO2:** Perform the literature survey of selected topic to explore the new idea.
3. **CO3:** Identify the problem and formulate problem statement and provide solution with expected outcomes.
4. **CO4:** Work in team to develop the system using hardware and software during time bound frame and provide testing methodology.
5. **CO5:** List the findings, prepare technical report and give presentation.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	3	1	-	-	-	-
CO2	3	3	3	3	-	-	3	1	3	3	3	3
CO3	3	3	3	3	3	3	2	1	-	-	3	3
CO4	3	3	3	3	3	3	2	3	-	-	3	3
CO5	3	3	3	3	3	3	2	3	1	3	-	-
Avg.	3	3	3	3	3	3	2.4	1.8	2	3	3	3

EI47499: MAJOR PROJECT PHASE-II

COURSE OUTCOMES: After completion of Major Project Phase-II, students will able be to:

1. Work in group as team to identify and formulate problem statement.
2. Provide the solution methodology to implement the problem statement.
3. Proposed the test methodology and obtain the desired results.
4. Perform the analysis and provide comparison with existing work and future scope.
5. Demonstrate the writing skills for technical report and presentation.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	3	1	-	-	-	-
CO2	3	3	3	3	-	-	3	1	3	3	3	3
CO3	3	3	3	3	3	3	2	1	-	-	3	3
CO4	3	3	3	3	3	3	2	3	-	-	3	3
CO5	3	3	3	3	3	3	2	3	1	3	-	-
Avg.	3	3	3	3	3	3	2.4	1.8	2	3	3	3

CO-PO articulation Matrix
4th Year / 8th SEM
Academic Year: 2024-25 Session Jan-June 2025

BM-47613/BM47613 (Program Elective-V): MEDICAL INSTRUMENTATION

COURSE OBJECTIVES:

1. To introduce students to basic engineering technology.
2. To introduce students to different biological signals, their acquisition, measurement and related constraints.
3. To provide the students the knowledge of instrumentation involved in Bio-medical engineering.

COURSE OUTCOMES: After completing the course, the students will be able to:

1. **CO1:** Identify the concepts of Bio signal generation and transduction.
2. **CO2:** Discuss the basic concepts of Recording & analysis of physiological signals.
3. **CO3:** Identify compare and differentiate between various therapeutic instruments.
4. **CO4:** Distinguish between medical imagining modalities.
5. **CO5:** Report different analytical techniques.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	-	-	-	-	-	-	-
CO2	3	2	2	2	1	-	-	-	-	-	-	-
CO3	3	3	2	1	1	-	-	-	-	-	-	-
CO4	3	2	3	1	1	-	-	-	-	-	-	-
CO5	3	2	3	2	1	-	-	-	-	-	-	-
Avg.	3	2.4	2.4	1.6	1	-	-	-	-	-	-	-

EI-47611 (Program Elective-V): DIGITAL IMAGE PROCESSING

COURSE OBJECTIVES:

1. To introduce the concept of image processing and basic analytical methods to be used in image processing.
2. To familiarize the students with image enhancement and restoration techniques.
3. To introduce the different image compression techniques.

COURSE OUTCOMES: After completing the course, the student will be able to:

1. **CO1:** Define the visual perceptions, image sensing and image sampling.
2. **CO2:** To apply image, transform for 2D image and analyse using DFT, Haar, Hadamard.
3. **CO3:** To classify image enhancement techniques and image sharpening filters in image processing.
4. **CO4:** To explain different types of image reconstruction process.
5. **CO5:** To identify and apply image compression algorithms.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	1	-	-	-	-	-	-	-	-
CO3	3	3	1	1	-	-	-	-	-	-	-	-
CO4	3	3	2	1	-	-	-	-	-	-	-	-
CO5	3	3	3	1	-	-	-	-	-	-	-	-
Avg.	3	3	2	1	-	-	-	-	-	-	-	-

EI-47612 (Program Elective-V): COMPUTER NETWORKS

COURSE OBJECTIVES:

1. To make the students understand the fundamental concepts of computer networking.
2. Familiarize the students with basic terminology and taxonomy of computer networking.

COURSE OUTCOMES: After completion of course, the students will be able to:

1. **CO1:** Analyse the concepts of networks, types and architectures.
2. **CO2:** Identify error free transmission of data and analyse data collision with various protocols.
3. **CO3:** Apply various routing algorithms over a network to provide an optimal path.
4. **CO4:** Illustrate the real time applications of networks.
5. **CO5:** Examine the addressing entities of a network with implementation of TCP, UDP protocols.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	1	-	-	-	-	-	-	-
CO2	3	2	2	2	1	-	-	-	-	-	-	-
CO3	3	3	2	2	1	-	-	-	-	-	-	-
CO4	3	2	2	1	1	-	-	-	-	-	-	-
CO5	3	2	1	1	1	-	-	-	-	-	-	-
Avg.	3	2.4	2	1.6	1	-	-	-	-	-	-	-

EI-47776 (Program Elective-VI): AUTOMATION IN INSTRUMENTATION/NPTEL

COURSE OBJECTIVES:

1. The course is designed to give solid grounding of fundamental concepts of industrial automation systems and their control.
2. The course specifically focuses on architecture, components and techniques for automation in industries.
3. The level of the course is chosen such that the students aspiring to be part of industrial advancements directly or indirectly in future should acquire these concepts.

COURSE OUTCOMES: - At the end of course, the students will be able to:

1. **CO1:** Define automation, classify its types and application in instrumentation.
2. **CO2:** To identify components of data loggers, explain its operation and characteristics, needs for industry.
3. **CO3:** Illustrate the concepts of Microcomputer based numerical control system.
4. **CO4:** To analyse evolution of electronic system and instrumentation in terms of automation.
5. **CO5:** Illustrate the concepts of Virtual instrumentation with a few case studies.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	3	-	-	-	-	-	-	-	-
CO2	3	3	2	1	-	-	-	-	-	-	-	-
CO3	3	3	1	1	-	-	-	-	-	-	-	-
CO4	3	3	1	3	-	-	-	-	-	-	-	-
CO5	3	3	3	2	-	-	-	-	-	-	-	-
Avg.	3	2.8	1.6	2	-	-	-	-	-	-	-	-

EI-47701 (Program Elective-VI): DATA ACQUISITION SYSTEMS

COURSE OBJECTIVES:

1. To understand the concept of acquiring data from transducers/input devices.
2. To help the students to understand the fundamentals of real time embedded data acquisition system.
3. To provide the concept of interfacing and instrumentation system design in DAS.

COURSE OUTCOMES:

1. **CO1:** Identify the building blocks of Data Acquisition System.
2. **CO2:** Design the signal conditioning circuits for Data Acquisition Systems.
3. **CO3:** Analyse the DAQ system for Power Management & Timing.
4. **CO4:** Analyse DAQ system using DFT, FFT and DTFT algorithms.
5. **CO5:** Design the Data Acquisition Systems for static and dynamic accuracy.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	1	--	--	--	--	--	--	--	--
CO2	3	2	2	1	-	-	-	-	-	-	-	-
CO3	3	2	2	1	-	-	-	-	-	-	-	-
CO4	3	3	1	2	--	--	--	--	--	--	--	--
CO5	3	3	1	2	-	-	-	-	-	-	-	-
Avg.	3	2.6	1.8	1.4	--	--	--	--	--	--	--	--

EI-47881: INDUSTRIAL TRAINING/INTERNSHIP/SEMINAR

COURSE OBJECTIVES:

1. To provide the opportunity to students to learn more about the career while gaining meaningful on-the-job experience.
2. Help the students getting acquainted with current trends in industry.
3. To explore career opportunities prior to graduation and to integrate theory and practice.

COURSE OUTCOMES:

CO1: Explore career alternatives prior to graduation.
CO2: Develop work habits and attitudes necessary for job success.
CO3: Identify, write down, and carry out performance objectives.
CO4: Develop communication, interpersonal and other critical skills in the job interview process.
CO5: Develop Argumentative Skills and Critical Thinking.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1									
CO2	1	1	1		3	2		3		1	2	1
CO3		2	3	3	1	2	3	2	1	2	3	2
CO4	2	1	1	3	2	3			3	2	3	2
CO5	3	2	2	1	2	2	1	2	2	3	3	3
Avg.	1.75	1.8	1.6	2.33	2	2.25	2	2.33	2	2	2.75	2

EI-47999: MAJOR PROJECT PHASE-II

COURSE OUTCOMES: After completion of Major Project Phase-II, students will able be to:

1. Work in group as team to identify and formulate problem statement.
2. Provide the solution methodology to implement the problem statement.
3. Proposed the test methodology and obtain the desired results.
4. Perform the analysis and provide comparison with existing work and future scope.
5. Demonstrate the writing skills for technical report and presentation.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	3	1	-	-	-	-
CO2	3	3	3	3	-	-	3	1	3	3	3	3
CO3	3	3	3	3	3	3	2	1	-	-	3	3
CO4	3	3	3	3	3	3	2	3	-	-	3	3
CO5	3	3	3	3	3	3	2	3	1	3	-	-
Avg.	3	3	3	3	3	3	2.4	1.8	2	3	3	3

EI-47999 (BA-GROUP): MAJOR PROJECT PHASE-I

COURSE OBJECTIVES:

1. To provide the students with opportunity to apply the skills and knowledge acquired in their courses to a specific problem.
2. To allow the students to extend their academic experience into areas of interest and working with new idea.
3. To take on the challenges of teamwork, prepare a presentation in a professional manner and document all aspects of work.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	3	1	-	-	-	-
CO2	3	3	3	3	-	-	3	1	3	3	3	3
CO3	3	3	3	3	3	3	2	1	-	-	3	3
CO4	3	3	3	3	3	3	2	3	-	-	3	3
CO5	3	3	3	3	3	3	2	3	1	3	-	-
Avg.	3	3	3	3	3	3	2.4	1.8	2	3	3	3