SHRI G. S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
Department of Electronics and Telecommunication Engineering

COURSE ARTICULATION MATRIX
[CO-PO/PSO MAPPING]
Academic Year: 2023-2024

B.TECH. II Year [SEM A]: JULY-DEC 2023

1. **MA25014: Mathematics-III**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1					1			3	2	2	2
CO2	3	3	3	1					1			3	3	2	2
CO3	3	3	3	1					1			3	3	2	2
CO4	3	3	3	1					1			3	3	2	2
CO5	3	3	3	1					1			3	2	2	2
Average	3	3	3	1					1			3	2.6	2	2

COURSE OUTCOMES:
1. Identify real phenomena as models of partial derivative equations. Solve real problems by identifying them appropriately from the perspective of partial derivative equations.
2. Demonstrate their understanding of the Dirichlet conditions by using them to evaluate infinite series. Calculate the Fourier transform of elementary functions from the definition.
3. Select and combine the necessary Laplace transform techniques to solve second- order ordinary differential equations involving the Dirac delta (or unit impulse).
4. To understand the concept of solving differentiation and integration using approximation methods.
5. Able to solve algebraic and differential equations using numerical method.

2. **EC25016: Electronics Devices**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	1			1	2			2	3	3	3
CO2	3	2	3	2	1			2	2			3	3	3	3
CO3	3	2	3	2	1			2	1			3	3	3	3
CO4	3	3	3	2	1			1	1			3	3	3	3
CO5	3	3	3	2	1			1	1			3	3	3	3
Average	3	2.6	3	2	1			1.4	1.4			2.8	3	3	3

COURSE OUTCOMES:
1. Relate Semiconductor physics with various types of diode.
2. Design and analyze diode based electronics circuits and subsystem.
3. Analyze and design BJT based electronic circuits.
4. Design various applications based on JFET and MOSFET.
5. Acquire the knowledge of fabrication methods of integrated circuits and characteristics of various devices.

3. **EC25017: Signals and Systems**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3		2				2			3	3	3	3
CO2	3	3	3		2				2			3	3	3	3
CO3	3	3	3		2				2			3	3	3	3
CO4	3	3	3		2	2	2		2			3	3	3	3
CO5	3	3	3		2				2			3	3	3	3
Average	3	3	3		2	2	2		2			3	3	3	3

COURSE OUTCOMES:
1. Represent mathematically and analyze different types of signals and systems.
2. Define various properties of LTI systems and determine the response of an arbitrary excitation.
3. Analyze continuous and discrete systems in time and frequency domain using Fourier transforms.
4. Apply the knowledge of Laplace Transform and z-Transforms to analyze LTI systems.
5. Apply sampling and reconstruct a signal and understand applications of signals and systems.

4. **EE25004: Network Theory & Analysis**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1											3		
CO2		1	2	2									3		
CO3	1		2	2									3	2	
CO4	1		2										3	2	
CO5		1	2	2									3	2	1
Average	1	1	2	2									3	2	1

COURSE OUTCOMES:
1. Understand the sources and components used in electrical networks.
2. Analyze the electrical networks.
3. Design the two port network.
4. Analyze the electrical networks using various theorems
5. Enhance the mathematical knowledge of circuit analysis and to solve engg. problems.

5. **EC25018: Digital System Design**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	1	1						1	3	3	1	1
CO2	3	2	2	1	1							2	2	3	3
CO3	2	3	2	1	2							3	1	2	3
CO4	2	1	3	2	3							3	2	3	3
CO5	3	3	3	2	1						1	3	2	2	3
Average	2.6	2.2	2.6	1.4	1.6						1	2.8	2	2.2	2.6

COURSE OUTCOMES:
1. Solve the logical expressions through Boolean algebra and k-map.
2. Implement variety of logical devices using combinational circuits concepts.
3. Analyze sequential circuits like Registers and Counters using flip-flops.
4. Classify different logic families, semiconductor memories and PLD devices.
5. Design converters which facilitate the conversion of real world analog signals to digital and vice versa.

6. **HU25005: Economics for Engineers**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						1					2				1
CO2						1	1				3				1
CO3							1				3				1
CO4							1				2				1
CO5								2			3				1
CO6						1	1	1			3				1
Average						1	1	1.5			2.67				1

COURSE OUTCOMES:
1. Explain economic cyclic flow and Estimate the demand and demand elasticity for a product.
2. Plan the production; choose appropriate production technology (combination of production factors); and estimate feasible range of production.
3. Analyze the production-cost-profit relation and select the suitable project for investment
4. Estimate price and the equilibrium for a firm/organization in different competitive market situations.
5. Review, summarize and compare the financial statements of an accounting entity and able to apply financial ratio technique for financial analysis.
6. Identify the problems, see the opportunity, and ideate the solution to the problems

B.TECH. II Year [SEM B]: JAN-JUNE 2024

1. **MA25563: Mathematics IV**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1					1			3	2	2	2
CO2	3	3	3	1					1			3	3	2	2
CO3	3	3	3	1					1			3	3	2	2
CO4	3	3	3	1					1			3	3	2	2
CO5	3	3	3	1					1			3	2	2	2
Average	3	3	3	1					1			3	2.6	2	2

COURSE OUTCOMES:
1. To solve Engineering problems using complex variable techniques and line integrals of a complex valued function.
2. To apply the concept of probability to find the physical significance of various distribution phenomena.
3. Attain the basic techniques of quality improvement, fundamental knowledge of statistics and probability.
4. Understand the concepts of reliability and maintainability.
5. To apply principals and concepts of graph theory in practical situation.

2. **EC25564: Electromagnetic Waves**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	1			1	1				2	2	2	1
CO2	1	2	3	2				1				1	3	1	1
CO3	2	3	1	1	1	2		1				1	2	2	1
CO4	1	1	2	2	1	1	1					1	1	1	3
CO5	1	3	3	2	1	1	1					2	3	1	2
Average	1.4	2.4	2.4	1.6	1	1.3	1	1				1.4	2.2	1.4	1.6

COURSE OUTCOMES:
1. Study various laws to develop the Maxwell equations.
2. Characterize Uniform Plane Wave in different mediums.
3. Calculate reflection and transmission of waves at media interface.
4. Design and Analyse of Transmission lines to carry out the impedances transformations.
5. Analyse wave propagation on metallic waveguides in modal form.

3. **EC25565: Analog Circuits**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3		2	1		1	2			1	3	3	3
CO2	3	2	3		2	1		1	2			1	3	3	3
CO3	3	2	3		2	1		1	2			1	3	3	3
CO4	3	2	3		2	1		1	2			1	3	3	3
CO5	3	2	3		2	1		1	2			1	3	3	3
Average	3	2	3		2	1		1	2			1	3	3	3

COURSE OUTCOMES:
1. Analyze and design BJT and FET based amplifier for required frequency specifications.
2. Understand and design power efficient amplifiers.
3. Improve amplifier performance by varying various parameters and design various frequency generators.
4. Design amplifiers for various linear and non-linear mathematical operations using linear integrated circuits.
5. Study and design various wave form generators and active filters using linear integrated circuits.

4. EC25566: Probability Theory and Stochastic Processes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2			1	2	1		2	2	2	1
CO2	3	3	3	3	2			1	2	1		2	2	2	1
CO3	3	3	3	3	2			1	2	1		2	2	2	1
CO4	2	2	2	2	2			1	2	1		2	2	2	1
CO5	2	2	2	2	2			1	2	1		2	2	2	1
Average	2.6	2.6	2.6	2.6	2			1	2	1		2	2	2	1

COURSE OUTCOMES:
1. Understand basic concept of probability theory and continuous Random Variable.
2. Investigate discrete random variable and application.
3. Study joint function, moments and distribution.
4. Make use of theorems related to random signals.
5. Develop concepts of Random processes and its application.

5. EC25567: Analog and Digital Communication

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	1	1		1			1		1	2	2	
CO2	3	2	2	1	2	2				3		1	2	1	1
CO3	3	1	3	1	2					2			2	1	1
CO4	3	1	1	1	1					3		1	3	1	1
CO5	3	2	2	2	1					2		1	3	2	1
Average	2.8	1.4	2	1.2	1.4	2	1			2.2		1	2.4	1.4	1

COURSE OUTCOMES:
1. Compare different Continuous Wave modulation schemes.
2. Study the behavior of Communication systems in presence of noise.
3. Investigate Pulse modulation schemes and multiplexing schemes.
4. Analyze different digital modulation and demodulation schemes.
5. Evaluate error performance of digital communication systems.

6. EC25568: Electronics Workshop

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1			2	2	1					2	1		1
CO2	1	2	1		1				3		2		2	1	
CO3	1	3	1	1	1	1									
CO4	1	1	3	2	2	2	1		1			2	3		
CO5	2					2	1	3	2	3	3	3		2	3
Average	1.4	1.75	1.67	1.5	1.5	1.75	1	3	2	3	3	2.33	2	1.5	2

COURSE OUTCOMES:

1. Identify various types of electronic components and subsystems and apply them in various Electronic circuits.
2. To understand the working and principle of different types of electronics circuit.
3. Analyze electronics circuits and systems, diagnose faults and their rectification.
4. Design, fabrication and testing of different types of electronics subsystem using analog and digital ICS.
5. Develop skills of writing a structured technical document and its presentation.

B.TECH. III Year [SEM A]: JULY-DEC 2023

1. EC35008: Microprocessors and Microcontrollers

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3							3	2	2
CO2	3	3	3	3	3	3							3	2	2
CO3	3	3	3	3	3	3	1			2			3	3	2
CO4	3	3	3	3	3	3	3	3	3	2		2	3	3	3
CO5	3	3	3	3	3	3	3	3	3	2		2	2	3	3
Average	3	3	3	3	3	3	2.3	3	3	2		2	2.8	2.6	2.4

COURSE OUTCOMES:
1. Interpret the basic architecture of 8-bit microprocessors and their operation using assembly language programming and interfacing concepts.
2. Distinguish the properties of 8-bit and 16 microprocessors with their programming and interfacing models.
3. Explain the internal design of the 8051 microcontrollers along with the features and the programming.
4. Apply the interfacing and programming knowledge of microcontroller for the real-time problem-solving.
5. Design processor and controller-based applications using compatible peripherals.

2. EC35009:Antenna and Wave Propagation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2		3	2	2				2	2	2	1
CO2	3	3	1	2	3	2	1					3	3	2	1
CO3	3	3	2	3	3	2	1		1	1		2	2	1	1
CO4	3	3	3	3	3	1			1				2	2	1
CO5	3	3	1	2	1	3	3	1		1	1	2			1
Average	3	3	2	2.4	2.5	2.2	1.75	1.5	1	1	1	2.25	2.25	1.75	1

COURSE OUTCOMES:
1. Explain the radiation mechanism of EM waves by antennas and their radiation patterns.
2. Interpret the relationships between antenna performance parameters.
3. Design and analyze different antennas and antenna arrays.
4. Analyze and distinguish different type of antennas.
5. Discuss atmospheric structure and its impact on radio wave propagation.

3. EC35010: VLSI Design

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	1	1	1	1			1	3	3	2
CO2	3	3	3	3	3	1		2	1	3		1	3	3	3
CO3	3	3	3	2	3	1		2	1			1	3	3	2
CO4	3	3	3	3	3	1		2	1			1	3	3	2
CO5	3	2	2	2	1	1		2	1			1	3	3	2
Average	3	2.6	2.6	2.2	2.2	1	1	1.8	1	3		1	3	3	2.2

COURSE OUTCOMES:
1. Study the basic VLSI design flow.
2. Write and simulate HDL code for basic combinational and sequential circuits. & understand the basics of synchronous finite state machines.
3. Analyze the static & dynamic characteristics of CMOS inverter.
4. Design combinational & sequential logic circuits
5. Understand the basics of memory design and working of programming logic devices such as CPLD and FPGA.

4. EC35011: Data communication

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1				1			1	3	3	3
CO2	3	3	3	3	1				1			1	3	3	3
CO3	3	3	3	3	1				1			1	3	3	3
CO4	3	3	3	3	1				1			1	3	3	3
CO5	3	3	3	3	1				1			1	3	3	3
Average	3	3	3	3	1				1			1	3	3	3

COURSE OUTCOMES:
1. Understand Concept of Information theory and Channel Capacity.
2. Study various channel coding techniques and theory application.
3. Develop basics of various data communication systems and its components.
4. Analyze various communication systems using different digital data transmission and access techniques.
5. Apply different digital switching techniques and protocols for data transmission.

5. CO35251: Data Structures and Operating Systems

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2				2	1		1	2	3	1
CO2	3	3	3	2	2				2	1		1	2	2	1
CO3	3	3	2	2					2			1	2	2	1
CO4	3	3	3	2	2				2			1	2	2	1
Average	3	3	2.75	2	2				2	1		1	2	2.25	1

COURSE OUTCOMES:
1. Identify linear versus nonlinear data structures, Understand common data structures and be able to implement them, choose appropriate data structures for problem solving and show how data structures map onto physical memory.
2. Compare different implementations of the same data structure, Manipulate data structures with basic operations.
3. The general structure and purpose of an operating system, the concepts of process, address space, and file, process deadlock, deadlock avoidance and recovery, Compare and contrast various CPU scheduling algorithms.
4. Understand different memory management techniques and be able to describe the advantages and disadvantages of each, Storage systems– disks.

6. EC35252: Electronics Measurements

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	3	2	1	2	2	1				2	3		
CO2	2	2	2	1	2	1	2	1	1			1	2	1	1
CO3	2	3	3	1	2	1		1	1	1	1	2	3		
CO4	2	3	3	2	2	2	1	1				1	3		
CO5	3		3		3								3		
Average	2.2	2.25	2.8	1.5	2	1.5	1.67	1	1	1	1	1.5	2.8	1	1

COURSE OUTCOMES:

1. Study various types of measuring instruments & their characteristics with their applications in various electronic circuits.
2. Measure signals, diagnose fault in electronics circuits & systems and its rectification.
3. Design and analyze transducer based measurement circuits.
4. Understand the electronic measurement circuits and subsystems.
5. Analyze and measurement of high frequency circuit parameters.

B.TECH. III Year [SEM B]: JAN-JUNE 2024

1. **EE35510: Control Systems**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	2	2	1										
CO2		3	2	2											
CO3		3	2	2	1										
CO4			2	2	1										
CO5		3			1										
Average	1	3	2	2	1										

COURSE OUTCOMES:
1. Develop mathematics models (TF and state space) of various physical systems.
2. Define time domain and frequency domain specifications of a control system.
3. Determine stability of a control system using time domain techniques and design appropriate controller for a given problem.
4. Propose alternate solution via compensator design to get desired frequency domain specifications.
5. Explain concepts of controllability and observability as well design of state feedback controller.

2. **EC35511: Mobile Communication**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1				1			1	3	3	3
CO2	3	3	3	3	1				1			1	3	3	3
CO3	3	3	3	3	1				1			1	3	3	3
CO4	3	3	3	3	1				1			1	3	3	3
CO5	3	3	3	3	1				1			1	3	3	3
Average	3	3	3	3	1				1			1	3	3	3

COURSE OUTCOMES:
1. Understand basics of cellular communication and its various standards.
2. To know the fading mechanism and effect of Large Scale Fading on Mobile communication.
3. Analyze the fading channel characteristics on small-scale and study their effects on radio wave propagation.
4. Demonstrate knowledge of different fading mitigation techniques.
5. Understand fundamental concepts of various speech coding, modulation techniques and GSM architecture.

3. **EC35513: Computer Networks**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1			1		1	1		1	3	1	3
CO2	1	2	2	3			1		2	2		2	3	2	3
CO3	2	3	3	3			3		2	2		3	3	2	3
CO4	1	2	2	2			3		1	3		3	3	2	3
CO5	1	3	3	2			2		1	2		3	3	2	3
Average	1.2	2.2	2.2	2.2			2		1.4	2		2.4	3	1.8	3

COURSE OUTCOMES:
1. Understand the basics of computer network architecture, topology, and network model.
2. Analyze the design issues of various MAC layer protocols for deployment of Ethernet/IEEE Standards.
3. Illustrate the design issues of network layer and transport layer protocols in computer networks.
4. Develop the concepts of routing algorithms and routing protocols.
5. Descibe the design issues of WAN and advanced computer network architecture.

4. EC35514: Applied Digital Signal Processing

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3		3				3	3	1	3	3	2	2
CO2	3	3	3		3				3	3	1	3	3	2	2
CO3	3	3	3		3				3	3	1	3	3	2	2
CO4	3	3	3		3				3	3	1	3	3	2	2
CO5	3	3	3		3				3	3	1	3	3	2	2
Average	3	3	3		3				3	3	1	3	3	2	2

COURSE OUTCOMES:
1. Apply Fourier and z-transforms to represent and analyze LTI discrete time systems.
2. Compute numerically the response of discrete time systems (DTS) for finite time inputs.
3. Analyze and design digital IIR and FIR filters.
4. Implement the DTS and analyze the effects of finite word length and estimate the power spectrum.
5. Analyze and design multirate signal processing systems and understand applications of Digital Signal Processing.

5. EC35661: Embedded Systems

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3							3	2	2
CO2	3	3	3	3	3	3							3	2	2
CO3	3	3	3	3	3	3	1			2			3	3	2
CO4	3	3	3	3	3	3	3	3	3	2		2	3	3	3
CO5	3	3	3	3	3	3	3	3	3	2		2	2	3	3
Average	3	3	3	3	3	3	2.3	3	3	2		2	2.8	2.6	2.4

COURSE OUTCOMES:
1. Classify various RISC microcontrollers and explain AVR microcontroller's architecture.
2. Identify the features of AVR microcontrollers and interface them with various modules for real-time application designs.
3. Interpret the architecture of mixed-signal processors (MSP430) and learn its programming.
4. Understand the ARM Processor's Architecture and Basic Concept of RTOS.
5. Explain the ARM controller architecture, its programming and make use of RTOS for application designs.

6. **IT35662: Intelligent Systems**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1									1	3	2	2
CO2	3	3	1	2	2							1		1	1
CO3	3	3	2	2								1	1	2	1
CO4	3	2	2									1	3	1	1
CO5	3	2	2									1	2	1	1
Average	3	2.4	1.6	2	2							1	2.25	1.4	1.2

COURSE OUTCOMES:
1. Explain the basics concepts of A.I. and problem solving through searching.
2. Apply fuzzy logic concept for given situation.
3. Design the neural network model for given real world scenario.
4. Describe various machine learning algorithms to solve real time problem.
5. Apply various machine algorithm for given dataset.
6. Explain concept of intelligent system and agents and significant of machine learning.

7. **EC35881: Electronics Design and Simulation Lab**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	1	3			1	3			3	3	3	3
CO2	3	2	3	1	3			1	3			3	3	3	3
CO3	3	2	3	1	3			1	3	3		3	3	3	3
CO4	3	2	1	1	3			1	3			3	3	3	3
CO5	3	2	3	1	3	2		1	3	3	3	3	3	3	3
CO6	3	2	3	1	3	2		1	3	3	3	3	3	3	3
Average	3	2	2.6	1	3	2		1	3	3	3	3	3	3	3

COURSE OUTCOMES:
1. Understand various types of Microcontrollers and their Architecture.
2. Analyze various Simulation software for Microcontrollers
3. Write code and simulate various microcontroller based circuits.
4. Interface various peripheral devices with microcontroller and calculate power requirement.
5. Install Linux based OS for Microcontrollers.
6. Design a microcontroller based working hardware project.

B.TECH. IV Year [SEM A]: JULY-DEC 2023

1. **EC45009: Wireless and Mobile Networks**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	3	2	1	3			1		1	3	2	2
CO2	1	2	3	2	2	1	1			2	1	2	3	2	1
CO3		1	2	3	2		2			2		2	2	2	
CO4		1	2	3	2		2			2		2	2	2	
CO5	2	1	3	3	2	1	2			2		2	3	2	1
Average	1.33	1.4	2.6	2.8	2	1	2			1.8	1	1.8	2.6	2	1.33

COURSE OUTCOMES:
1. Understand basic technologies implied in 3G and 4G mobile networks.
2. Learn device to device and millimeter wave communication in 5G networks.
3. Develop the basic concepts of wireless sensor network and its protocols
4. Describe the routing mechanism inside wireless sensor networks.
5. Classify the technology and standards of Mobile IP, Bluetooth, ZigBee and RFID.

2. **EC45207: Microwave Devices and Circuits**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1			1						2	3	1	
CO2	3	2	2	1	1							1	3	2	1
CO3	3	2	2	1	1							1	3	3	1
CO4	3	3	3	3	1							1	3	2	
CO5	2	2	3	1	1							1	3	1	
Average	2.8	2	2.2	1.5	1	1						1.2	3	1.8	1

COURSE OUTCOME:-
1. Understanding the scattering parameters and corresponding instruments.
2. Identify various types of Microwave electronic components and systems.
3. Study of different modes of operation of various RF and Microwave devices andcircuits.
4. Design and analysis of dielectric resonator circuits and systems.
5. Solving complex RF amplifiers parameters; Microwave communication networkdesign problems.

3. **EC45208: Optical Communication**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	2	2					2		1	3	2	
CO2	3	1	3	3	2	1	1			2		1	3	2	1
CO3	3	3	3	3	2	1				1		2	3	3	1
CO4		2	3	3	2		1			2	1	2	2	3	2
CO5	3	2	3	3	2					2		3	3	3	1
Average	3	1.8	2.8	2.8	2	1	1			1.8	1	1.8	2.8	2.6	1.25

COURSE OUTCOMES:
1. Understand Optical Fiber Communication System and its parameters.
2. Analyze transmission characteristics of optical fiber and their effects.
3. Understand the construction and operation of various optical sources and detectors.
4. Design and study performance analysis of optical receivers.
5. Brief introduction of optical fiber networks and amplifiers.

4. CO45251: Data Science

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1										2	2	1	2
CO2	2	1	1	1	2				1			2	1	1	1
CO3	2	2	1	1	2				1			2	3	1	2
CO4	2	3	3	2	3				1			2	2	1	2
Average	2.25	1.75	1.66	1.33	2.33				1			2	2	1	1.75

COURSE OUTCOMES:
1. Comprehend the IT-interestingness of data and understand the attributes of data.
2. Pre-process the given data and visualize it for a given application or data exploration/ mining task.
3. Apply techniques of supervised and unsupervised machine learning for various data applications.
4. Implement web search methods by page ranking and can implement models of information retrieval by applying different techniques of text mining.

5. EI45252: VLSI Technology

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1		1	1		1	1			3	3	2
CO2	3	2	2	1		1	1		1	1	1		3	3	2
CO3	3	3	3	2		1	1		2	1	1		3	3	2
CO4	3	3	3	1			1		1	1	1		3	3	2
CO5	3	3	3	1		1			2	1	1		3	3	2
Average	3	2.6	2.6	1.2		1			1.4	1	1		3	3	3

COURSE OUTCOMES:
1. To describe crystal growth and wafer preparation methods.
2. To discuss layering in terms of chip fabrication.
3. Illustration of various patterning methods.
4. Gain knowledge about layout design rules, stick diagrams etc.
5. Illustration of subsystem design and memories.

6. EC45301: Internet of Things

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	3	1						3	3	3	2
CO2	3	1	3	1	3	2			3	3	1	3	3	2	2
CO3	3	2	2	2	3	2			3	3	1	3	3	2	2
CO4	3	3	3	3	3	2			3	3	2	3	3	2	2
CO5	3	3	3	3	3	2			3	3	3	3	3	2	2
Average	3	2	2.4	2	3	1.8			3	3	1.75	3	3	2.2	2

COURSE OUTCOMES:
1. Understand IoT architecture and IoT decision framework.
2. Configure Raspberry Pi, understand sensors, actuators & get started with Python on Raspberry Pi.
3. Understand various IoT networking protocols used to develop communication solutions.
4. Able to design architecture for an end-to-end solution and perform data analytics.
5. Understand IoT challenges, business solutions, research scope and current development.

7. BM45303: Digital Image Processing

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	2				1		1	2	3	3
CO2	3	3	3	3	1		1		1				2	2	2
CO3	2	3	2	2				1					2	1	2
CO4	2	3	2	2									2	1	2
CO5	2	2	2	2									1	1	1
Average	2.25	2.8	2.4	2.4	1.5	2.0	1	1	1	1.0		1	1.8	1.6	2

COURSE OUTCOMES:
1. Study of fundamentals of image processing and image perception.
2. Introduction to image enhancement spatial domain techniques.
3. Introduction to image restoration: noise degradation model.
4. Introduction to different image transforms.
5. Concepts of image analysis, feature extraction etc

8. IP45010: Industrial Engineering and Management

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	2		1	2	2		3	1	2	3
CO2	0	2	3	2	3	2	2	2	3	3	3	3	1	2	3
CO3	2	2	1	2	3	2	2	2	3	3	3	3	1	2	3
CO4	3	3	3	3	3	2	2	1	2	3	3	3	1	2	3
Average	2	2.5	2.5	2.25	3	2	2	1.5	2.5	2.75	3	3	1	2	3

COURSE OUTCOMES:
1. To understand and apply the concepts of work study for productivity improvement.
2. To comprehend the basic fundamentals of management and organization.
3. To grasp and apply the concepts of personnel management and identify the problems associated with human resource.
4. To identify and solve the problems related to quality management and apply the quantitative decision making in managerial decision making

9. EC45498: Major Project Phase-I

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	2	2	1	1		1	2	1	2		2	1	1
CO2	1	2	3	2	2	1	1	1	3	1	2	1	2	2	1
CO3	3	2	1	1	2	1	1	1	1	2	1	2	2	2	1
CO4	2	1	1	1	2	1	1	1	1	3	2	2	2	1	1
CO5		1	1	1		2			3	2	1	2	1	1	1
Average	1.75	1.8	1.6	1.4	1.75	1.2	1	1	2	1.8	1.6	1.75	1.8	1.4	1

COURSE OUTCOMES:
1. Identify the problem statement for project work through review of Literature.
2. Select an appropriate design strategy for project work & decide its flow of execution to arrive at conceptual project design.
3. Apply the knowledge acquired through various courses of B.Tech Program for project work.
4. Write a synopsis for the project work.
5. Develop an ability to work in a team.

B.TECH. IV Year [SEM B]: JAN-JUNE 2024

1. **EC45602: Optical Networks**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2				1			1	3	2	1
CO2	3	2	3	3	2				1			2	3	3	2
CO3	3	2	2	3	2				1			1	3	3	2
CO4	3	2	3	3	2				1			2	3	3	2
CO5	3	2	3	3	2				1			2	3	3	2
Average	3	2	2.6	2.8	2				1			1.6	3	2.8	1.8

COURSE OUTCOMES:
1. Discuss the second generation of Digital transport network (SONET/SDH).
2. Analyze the architecture of Optical Transport Network.
3. Understand the architecture and operation of WDM Network.
4. Design of optical network consisting of routers.
5. Investigate various optical access networks.

2. **EC45759: Satellite & Radar Communication**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3				1					2	3	1	
CO2	3	3	3	2	1	1		2	1	1	2	2	3	2	1
CO3	3	2					2			1		3	3		1
CO4	3	1	1				1			1	2	1	1	3	1
CO5	3	3	2	1			2		1	1		2	2	1	
Average	3	2.4	2.25	1.5	1	1	1.5	2	1	1	2	2	2.4	1.75	1

COURSE OUTCOMES:
1. Describe the motion of a satellite in orbit and its mechanism, and apply the concept of communication systems into the satellite communication system.
2. Demonstrate the design strategies for the satellite link budget, and compare the multiple access techniques.
3. Illustrate the concept of GPS and discuss various satellite applications.
4. Implement techniques of design of small satellites and explain the working concept of satellite launch vehicles and their classification.
5. Discuss the working concept of RADAR systems with their applications.

3. **EC45998: Major Project Phase-II**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	3	2	3	1	2	1	2		2	1	3	1	1
CO2	1	2	3	1	3	1	1		3	1	3	1	3	2	1
CO3	1	2	3	1	3	1	1		3	1	3	1	3	2	1
CO4	1	1	3	1	1	1	1		3	2	3	1	3	1	1
CO5	1	1	1	2	2	2	2		3	2	2	1	2	2	1
Average	1.2	1.4	2.6	1.4	2.4	1.2	1.4	1	2.8	1.5	2.6	1	2.8	1.6	1

COURSE OUTCOMES:
1. Select appropriate Hardware for project work.
2. Identify the appropriate software tools for design & Simulation.
3. Apply appropriate Hardware & Software tools to execute the project work.
4. Develop an ability to work in a team.
5. Write a technical project report & develop presentation, communication skills through the project work.