Item 6

B.Tech. IV Semester (Electronics and Telecommunication Engineering)
Microprocessor & Interfacing (20242201)

Course Objective: To provide the knowledge of 8086 microprocessor architecture, assembly language programming, peripheral interfacing, microcontroller systems, and their applications in modern Industry environments.

Unit I: 8086 Microprocessor Architecture: Evolution of microprocessors: generations, features, and applications, CISC and RISC architectures, Register Organisation of 8086, Architecture, Signal Descriptions of 8086, Physical Memory Organisation, General Bus Operation, I/O Addressing Capability, Minimum and Maximum Mode 8086 System.

Unit II: 8086 Assembly Language Programming: Machine Language Instruction Formats, Addressing Modes of 8086, 8086 instruction set, Data transfer, arithmetic, logical, shift and rotate, branching, loop control and string instructions, Interrupts, processor control instructions with simple examples.

Unit III: Peripheral Devices and their Interfacing: Introduction to Memory interfacing and IO devices (IO mapped IO& Memory mapped IO), Peripheral devices: Programmable Peripheral interface 8155/ 8255, Programmable interval timer 8253/8254.

Unit IV: Microcontrollers & Embedded Systems: Introduction to microcontrollers and embedded systems, 8051 architecture, Pin description, I/O configuration, Interrupts, Addressing modes, an overview of 8051 instruction set and programming.

Unit V: Industry 4.0 applications: Smart manufacturing: ARM controllers for smart factory systems, robotics: DSP processors in robots, machine vision: AI processors in machine vision inspection, IoT gateways & predictive maintenance: IoT processors such as ESP32 used for sensor monitoring. ***[Dynamic Unit, 2025]***

Text Book

1. Kenneth J. Ayala, The 8086 Microprocessor: Programming & Interfacing,Cengage India,Ist Edition .
2. Mazidi & Mazidi, The 8051 Microcontroller and Embedded Systems,Prentice Hall,2nd Edition.
3. A.K. Ray and K. M. Bhurchandi , "Advance Microprocessor and Peripheral", Tata Mcgraw Hill,3rd Edition.

Reference Books

1. Douglas V. Hall – Microprocessors and Interfacing,McGraw-Hill2nd Edition.,
2. Barry B. Brey – The Intel Microprocessors, Prentice Hall, 8th Edition.
3. Raj Kamal – Embedded Systems: Architecture, Programming and Design,McGraw-Hill, 2nd Edition..
4. Steve Furber – ARM System-On-Chip Architecture (for modern embedded concepts), Pearson, 2nd Edition.

Course Outcomes

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

CO 1. Explain microprocessor architecture, internal organization, and system-level functions of the 8086.
CO 2. Develop assembly language programs for 8086.
CO 3. Interface memory and peripheral ICs (8255, 8253/54, 8259, 8251, ADC/DAC) with 8086 microprocessor systems.
CO 4. Describe the architecture and programming of the 8051 microcontroller.
CO 5. Apply embedded system concepts to real-time industrial and automation scenarios.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	2	1	1	1	1	1	1	3	2
CO2	3	3	2	2	0	1	1	1	0	1	2	1	3	1
CO3	3	3	1	1	1	2	0	1	1	2	1	2	3	2
CO4	3	2	2	2	0	1	2	1	0	1	2	1	3	1
CO5	3	2	1	1	01	1	2	1	2	1	2	1	3	1

1 - Slightly; 2 - Moderately; 3 – Substantially

B.Tech. IV Semester (Electronics and Telecommunication Engineering)
Digital Signal Processing (20242202)

Course Objectives: The course aims to provide strong foundation in digital signal processing by enabling students to understand discrete-time signal behavior, analyze systems in transform domains, design digital filters, and apply DSP techniques in modern industrial applications.

Unit I: Discrete-Time Signals, Systems & Transforms: Review of discrete-time signals and systems, LTI systems, convolution, and stability, Discrete-Time Fourier Transform (DTFT): properties & applications, Z-Transform: region of convergence, properties, inverse Minimum-phase, maximum-phase, and mixed-phase systems, Inverse systems and phase characteristics.

Unit II: Discrete Fourier Transform & Fast Algorithms: Introduction to DFT and its properties, Linear convolution vs. Circular convolution, Efficient computation using FFT, Decimation-in-Time (DIT) FFT algorithm, Decimation-in-Frequency (DIF) FFT algorithm, Radix-2 and Radix-4 FFT structures, FFT applications in filtering and spectrum analysis.

Unit III: Digital Filter Design – IIR Filters: Characteristics of IIR filters, Signal-flow graph structures of IIR filters, Analog filter approximations: Butterworth, Chebyshev, Elliptic Impulse Invariant Method, Bilinear Transformation Method, Implementation considerations

Unit IV: FIR Filters: FIR filter characteristics and structures, Symmetric and Asymmetric FIR filters, Linear-phase FIR design, Windowing techniques: Rectangular, Hamming, Hanning, Blackman, Frequency Sampling Method.

Unit V: Industrial Applications of DSP: Multirate Signal Processing, Biomedical signals (ECG/EEG), image & video processing, radar/sonar, IoT sensor processing. ***[Dynamic Unit, 2025]***

Textbooks

1. John G. Proakis & Dimitris Manolakis, Digital Signal Processing: Principles, Algorithms, and Applications, Pearson Education, 4th Edition, 2007.
2. Alan V. Oppenheim & Ronald W. Schafer, Discrete-Time Signal Processing, Pearson 3rd Edition, 2010.

Reference Books

1. Sanjit K. Mitra, Digital Signal Processing, McGraw-Hill 4th Edition, 2011.
2. S. Salivahanan, Digital Signal Processing, McGraw-Hill 3rd Edition, 2019.

Course Outcomes:

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

CO 1. **Analyze** discrete-time signals and systems using convolution, DTFT, and Z-transform.
CO 2. **Apply** DFT and FFT algorithms for spectral analysis and signal processing.
CO 3. **Design** IIR digital filters using classical approximation methods.
CO 4. **Design** FIR filters using windowing and frequency sampling techniques.
CO 5. **Apply** DSP concepts to real-world applications in biomedical, radar, video, and IoT systems.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	1	0	0	0	1	1	0	1	2	3
CO2	3	3	2	3	2	0	0	0	1	1	0	1	2	3
CO3	3	2	3	2	2	0	0	0	1	1	0	2	2	3
CO4	3	2	3	2	2	0	0	0	1	1	0	1	2	3
CO5	2	2	3	3	3	1	1	0	0	0	0	1	0	2

1 - Slightly; 2 - Moderately; 3 – Substantially

B.Tech. IV Semester (Electronics and Telecommunication Engineering)
Quantum Computing (20242203)

Course Objective:- To provide a basic understanding of quantum information, computation, algorithms, and their applications in electronics.

Unit I: Qubits and quantum states : Classical & quantum information, Needs of Quantum information, qubits, quantum computing and laws of physics, quantum information, quantum computers, vector spaces, postulates of quantum mechanics, linear combinations, basis & dimensions, inner products, Cauchy-schwartz and triangle inequalities.

Unit II: Matrices & Operators - Pauli operators, outer products & matrix representation, Hermitian, unitary & normal operators, eigenvalues and eigen vectors, characteristic equation, trace of an operator, expectation value of an operator, projection operators**.**

Unit III: Entanglement & Quantum Gates: Entanglement, exchange of information using entangled particles, Bell's theorem, Bipartite systems and the Bell basis. classical logic gates and circuits, one qubit quantum gates, the Hadamard gate, two qubit quantum gates- the CNOT gate, three qubit quantum gates- The Fredkin gate, The Toffoli gate, quantum circuits, universal quantum gates.

Unit IV: Quantum Algorithms & Cryptography: classical to quantum Turing machines, computational complexity, quantum algorithms, quantum interference, Deutsch's algorithm, The Deutsch-Josza Algorithm, Shor's Algorithm, Grover's Algorithm, quantum cryptography, BB84-emergence of quantum cryptography, quantum noise and error correction.

Unit V: Quantum in Electronics: Fundamentals of Quantum Sensors for high efficiency applications, Quantum signal processing for enhanced performance applications. ***[Dynamic Unit, 2025]***

Text Books:

1. Quantum Computing Explained- David McMahon, Wiley Interscience, Wiley-Interscience (John Wiley & Sons), 2007, 1st Edition, ISBN: 978-0470096996
2. Quantum computing- Mika Hirvensalo, Springer, Undergraduate Texts in Mathematics, 2004 (2nd Edition), ISBN: 978-3540406969
3. Quantum Computation and Quantum Information-Michael Nielsen & Chuang, Cambridge University Press, 10th Anniversary Edition (or latest), 2010, ISBN: 978-1107002173

Reference Books:

1. An introduction to quantum computing- Phillip Kaye, Oxford University Press, 2007, 1st Edition, ISBN: 978-0198570004
2. Lectures on Quantum Information- Dagmar Brub, GerdLeuchs, Wiley-VCH, 2006, 1st Edition, ISBN: 978-3527405275
3. Quantum Computing- J. Stolze, Dieter Suter, Springer, Lecture Notes in Physics / Graduate Texts, 2nd Edition (2008) or latest, ISBN: 978-3540850601

Course Outcomes

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

CO 1. **Explain** the basics of quantum information, qubits, and quantum state representation using vector spaces and quantum postulates..
CO 2. **Apply** matrix algebra to analyze quantum operators such as Pauli, Hermitian and Unitary operators.
CO 3. **Implement** various quantum gates and circuits including universal gate sets.
CO 4. **Analyze** quantum algorithms and principles of quantum cryptography.
CO 5. **Analyze** the role of quantum sensors and techniques in modern electronic systems.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

B.Tech. IV Semester (Electronics and Telecommunication Engineering)
Electromagnetic Fields & Antenna Theory (20242204)

Course Objective: To develop a strong understanding of electromagnetic field theory and apply it to analyze and design modern antennas.

Unit I: Electrostatics: Electric field, Coulomb's law, Gauss's law and applications, Electric potential, Conductors in static electric field, Dielectrics in static electric field, Electric flux density and dielectric constant, Boundary conditions, Electrostatic energy, Poisson's and Laplace's equations,, Stokes theorem, Helmholtz theorem

Unit II: Magnetostatics: Lorentz force equation,, Amperes law, Vector magnetic potential, Biot-Savart law and applications, Magnetic field intensity and idea of relative permeability, Magnetic circuits,, Boundary conditions, Inductance and inductors, Magnetic energy, Magnetic forces and torques

Unit III: Time-Varying Fields And Maxwell's Equations: Faradays law, Displacement current and Maxwell-Ampere law, Maxwells equations (differential and integral form), Electromagnetic boundary conditions, Wave equations and solutions, Time-harmonic fields

Unit IV: Antenna Fundamentals & Types: Radiation Mechanisms and Radiation Pattern, Antenna Parameters: Gain, Directivity, Efficiency, Bandwidth, and Array Factor Theory, Antenna Array, Dipole antenna.

Unit V: Industrial Antennas: Yagi-Uda antennas, Micro-strip antenna. Broadband antennas- Traveling wave antennas, Helical antennas, Antenna array and Log - periodic antennas, Massive MIMO for 5G Network and IoT connectivity, Smart Antenna. ***[Dynamic Unit, 2025]***

Text Books:

1. Cheng, D. K. (1989). *Field and wave electromagnetics* (2nd ed.). Addison-Wesley.
2. Hayt & Buck – Engineering Electromagnetics.
3. Kraus, J. D., & Fleisch, D. A. (1999). Electromagnetics (5th ed.). McGraw-Hill.

Reference Books:

1. Balanis, C. A. (2016). *Antenna theory: Analysis and design* (4th ed.). Wiley.
2. Kraus, J. D., & Marhefka, R. J. (2001). Antennas (3rd ed.). McGraw-Hil.

Course Outcomes:
After successful completion of the course, students will be able to:

CO 1. **Apply** boundary conditions, dielectric properties, and vector theorems to evaluate electrostatic energy and field behavior in conductor–dielectric systems
CO 2. **Analyze** magnetic fields and magnetic circuits on appropriate boundary conditions.
CO 3. **Analyze** time-varying electromagnetic fields and time-harmonic field solutions by applying Maxwell's equations
CO 4. **Analyze** radiation mechanisms parameters and apply array factor theory to evaluate the performance of various antennas
CO 5. **Develop** electromagnetic field concepts and analyze their practical applications in antennas.

Course Articulation Matrix:

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

1 - Slightly; 2 - Moderately; 3 – Substantially

B.Tech. IV Semester (Electronics and Telecommunication Engineering)
VLSI Design (20242205)

Course objective: To develop the ability to analyze, design, and optimize CMOS devices, logic circuits, and VLSI subsystems with an understanding of timing, power, layout, and modern physical-design practices.

Unit 1: MOS Transistor Theory and Characteristics: The Metal Oxide Semiconductor (MOS) Structure, The MOS System under External Bias, Structure and Operation of MOSFET, MOSFET Current–Voltage Characteristics, MOSFET Scaling and Small-Geometry Effects MOSFET Capacitances, Introduction to MOS Inverters: Concept, Voltage Transfer Characteristics (VTC), Noise Immunity and Noise Margins

Unit 2: CMOS Inverters and Static Design: Resistive-Load and n-Type MOSFET Load Inverters, CMOS Inverter: DC Characteristics Calculation of VIL, VIH, VOL, VOH and Vth, Design of CMOS Inverters, Supply Voltage Scaling and Power–Area Considerations

Unit 3: Dynamic Characteristics and Power Dissipation: Switching Characteristics and Interconnect Effects, Delay-Time Definitions and CMOS Propagation Delay, Calculation of Delay Times, Dynamic Power Dissipation (Switching, Short-Circuit, Leakage), Power–Delay Product (PDP), Introduction to Delay Optimization and Sizing Concepts

Unit 4: Continuous and Discrete System analysis: CMOS Combinational Logic Circuits: NAND, NOR, CMOS Transmission Gates (Pass Gates) CMOS Process: n-Well / p-Well,Layout Design Rules, Stick Diagram, Layout of CMOS Inverter, Semiconductor Memories: RAM, ROM, SRAM Cell Design, 1T DRAM Cell Design Dynamic CMOS Logic and Domino Logic Circuits.

Unit 5: Industrial Practices in VLSI: Timing & Floorplanning: Introduction to Timing Analysis: Static Timing Analysis (STA) Concepts: Setup, Hold, Slack, Clock Skew, Timing Paths, Critical Path Identification, Gate Sizing and Buffer Insertion for Timing Closure, Introduction to Floorplanning and Physical Design Flow: Design Hierarchy: RTL-to-GDSII Overview, Floorplanning Principles: Aspect Ratio, Macro Placement, Routing Channels, Power Planning, Clock Tree Basics DRC and LVS Concepts. ***[Dynamic Unit, 2025]***

Text Books:

1. CMOS Digital Integrated Circuits: Analysis and Design, 3rd Edition: Sung-Mo Kang, Yusuf Leblebici, McGraw-Hill.
2. CMOS VLSI Design: A Circuits and Systems Perspective, 4th Edition: Neil H. E. Weste, David Harris, Pearson.

Reference Books:

1. Digital Integrated Circuits: A Design Perspective, 2nd Edition: Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolić, Pearson.
2. Basic VLSI Design: Douglas A. Pucknell & Kamran Eshraghian, 3rd Edition, PHI Learning

Course Outcomes:
After the completion of this course students will be able to:

CO 1. **Describe** MOS structure, MOSFET characteristics, scaling, and inverter fundamentals.
CO 2. **Design** CMOS inverters including DC characteristics and power–area considerations.
CO 3. **Evaluate** dynamic behavior of CMOS circuits including delay, power dissipation, and optimization.
CO 4. **Design** CMOS logic circuits, transmission gates, layouts, memory cells, and dynamic logic.
CO 5. **Apply** STA, timing closure, and floorplanning concepts for modern VLSI physical design.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

B.Tech. IV Semester (Electronics and Telecommunication Engineering)
Project Management, Economics & Financing (20242212)

Course Objectives:

To provide knowledge about project attributes and planning essentials, develop project networks, make rational decisions for project completion, utilize resources effectively, and understand the basics of project finances and management.

Unit I: Project Planning: Introduction to Project Management, Difference between Project and Production, Attributes of a Project: Time, Cost, Quality and Safety. Stakeholders of a Project, Project life cycle. Project Planning: Types of Project Plans and feasibility.

Unit II: Project Network logic: Project Networking and work flows, Activity duration and methods of estimating activity duration – One time estimate three time estimates, Duration estimation procedure. Use of Bar Charts, Mile stone charts and networks, Network representation schemes: Activity on Arrow and Activity on Node Networks (A-o-A & A-o-N), Logic behind developing project network and simple network calculations, Critical paths and floats.

Unit III: Decision making through networks: CPM, PERT & PDM: Use of network in Decision Making: Importance of critical path, Monitoring the progress and updating the project plan. Use of floats in Resource smoothening, Introduction to Precedence Diagramming Method (PDM), Different lag and lead relations in terms of SS(Start to Start), SF(Start to Finish), Finish to Start(FS), and Finish to Finish(FF) and composite relations.

Unit IV: Project Cost Control: Breakeven analysis in planning stage, Direct and indirect cost, slope of direct cost curve, Total project cost and optimum duration, contracting the network for cost optimization. Escalation & Variation in prices.

Unit V: Projects Financing: Introduction to project financing; Role of governments in financing projects, Funder and Concessionaire: Economic multiplier effects of Projects; Means of financing-public finance and private finance, Granting authority: World Bank Group, IMF,ADB, Micro and Small Enterprises Funding Scheme (MSME), Elementary understanding of Procurement of infrastructure projects through Public Private Partnership (PPP) route, Build Operate Transfer (BOT), Build Operate Own & Transfer (BOOT); Stakeholders' perspectives, Lifecycle of PPP projects, Micro & Macro economics concepts and its application in Project Financing. ***[Dynamic Unit, 2025]***

Course Outcomes:

At the end of the course student will be able to

- **CO 1. Know** the attributes of project and its different phases.
- **CO 2. Develop** the project network based on work breakdown structure and estimation of activity durations.
- **CO 3. Analyze** the project network and make decide the various alternates.
- **CO 4. Evaluate** the optimum cost of project for assigned deadlines.
- **CO 5. Understand** the different options to arrange the finances to complete it within stipulated time.

Text-Books:

1. Project Management Scheduling PERT and CPM by Dr. B.C. Punmia, K.K. Khandelawal
2. PERT & CPM Principles and Applications by L.S. Srinath, Affiliated EWP Pvt. Ltd.
3. Project Planning and Control by Albert Lester, Fourth Edition Elsevier Butterworth-Heinemann.

Reference Books:

1. A Management Guide to PERT/CPM With GERT/PDM/DCPM and Other networks by Jerome D. Wiest, Ferdinand K. Levy, Prentice Hall.
2. Project Management with CPM and PERT by Joseph J . Moder, Cecil R . Phillips, Van Nostrand Reinhold Company

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially