Jawaharlal Nehru Technological University
Anantapur
College of Engineering Pulivendula
(Accredited by NAAC with 'A' Grade)
Pulivendula –516 390 (A.P) India

B.Tech (Regular-FullTime)

ELECTRONICS & COMMUNICATION ENGINEERING

III & IV YEAR COURSE STRUCTURE & SYLLABUS

List of Open Electives offered by the Department

S.No.	Open Elective ID	Subject Name
1.	Open Elective – I	Basic Electronic Circuits
2.	Open Elective – II	Digital Electronics
3.	Open Elective – III	Microprocessors and Microcontrollers
4.	Open Elective – IV	Transducers and Sensors

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

III B.Tech I Sem (E.C.E) **L – T – P– C** **3 – 0 – 0 – 3**

BASIC ELECTRONIC CIRCUITS

(Open Elective –I)

UNIT-I

Semiconductor Diode and Applications: Introduction, PN junction diode – structure, operation and VI characteristics, Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Positive and Negative Clipping and Clamping circuits (Qualitative treatment only).

Special Diodes: Zener and Avalanche Breakdowns, VI Characteristics of Zener diode, Zener diode as voltage regulator, Construction, operation and VI characteristics of Tunnel Diode, LED, Varactor Diode, Photo Diode.

UNIT-II

Bipolar Junction Transistor (BJT): Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch and Amplifier, Transistor Biasing and Stabilization - Operating point, DC & AC load lines, Biasing - Fixed Bias, Self Bias, Bias Stability, Bias Compensation using Diodes.

UNIT-III

Single stage amplifiers: Classification of Amplifiers - Distortion in amplifiers, Analysis of CE, CC and CB configurations with simplified hybrid model.

Multistage amplifiers: Different Coupling Schemes used in Amplifiers - RC coupled amplifiers, Transformer Coupled Amplifier, Direct Coupled Amplifier; Multistage RC coupled BJT amplifier (Qualitative treatment only).

UNIT-IV

Feedback amplifiers: Concepts of feedback, Classification of feedback amplifiers, Effect of feedback on amplifier characteristics, Voltage Series, Voltage Shunt, Current Series and Current Shunt Feedback Configurations (Qualitative treatment only).

Oscillators: Classification of oscillators, Condition for oscillations, RC Phase shift Oscillators, Generalized analysis of LC Oscillators-Hartley and Colpitts Oscillators, Wien Bridge Oscillator.

UNIT-V

Op-amp: Classification of IC'S, basic information of Op-amp, ideal and practical Op-amp, 741 op-amp and its features, modes of operation-

inverting, non-inverting, differential.

Applications of op-amp : Summing, scaling and averaging amplifiers, Integrator, Differentiator, phase shift oscillator and comparator.

TEXT BOOKS:

1. J.Millman and Christos. C. Halkias, Electronics Devices and Circuits, 3rd edition, Tata McGraw Hill, 2006.

2. David A. Bell, Electronics Devices and Circuits Theory, 5th Edition, Oxford University press. 2008.

REFERENCE BOOKS:

1. R.L.Boylestad, LousisNashelsky and K.Lal Kishore, Electronics Devices and Circuits Theory, 12th edition, 2006, Pearson, 2006.

2. N.Salivahanan, and N.Suresh Kumar, Electronic Devices and Circuits, 3rd Edition, TMH, 2012

3. S.Sedra and K.C.Smith, Microelectronic Circuits, 5th Edition, Oxford University Press.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

III B.Tech I Sem (E.C.E) **L – T – P– C** **3 – 0 – 0 – 3**

Digital Electronics

(Open Elective –II)

UNIT-I

Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Introduction to Logic Gates, Ex-OR, Ex-NOR operations, Minimization of Switching Functions: Karnaugh map method, Logic function realization: AND-OR, OR-AND and NAND/NOR realizations.

UNIT-II

Introduction to Combinational Design 1: Binary Adders, Subtractors and BCD adder, Code converters - Binary to Gray, Gray to Binary, BCD to excess3, BCD to Seven Segment display.

UNIT-III

Combinational Logic Design 2: Decoders, Encoders, Priority Encoder, Multiplexers, Demultiplexers, Comparators, Implementations of Logic Functions using Decoders and Multiplexers.

UNIT-IV

Sequential Logic Design: Latches, Flip-flops, S-R, D, T, JK and Master-Slave JK FF, Edge triggered FF, set up and hold times, Ripple counters, Shift registers.

UNIT-V

Programmable Logic Devices: ROM, Programmable Logic Devices (PLA and PAL).

Digital IC's: Decoder (74x138), Priority Encoder (74x148), multiplexer (74x151) and de-multiplexer (74x155), comparator (74x85).

TEXT BOOKS:

1. M.Morris Mano & Michel D. Ciletti, Digital Design, 5th Edition, Pearson Education, 1999.

2. ZviKohavi and NirahK.Jha , Switching theory and Finite Automata Theory, 2nd Edition, Tata McGraw Hill, 2005.

REFERENCE BOOKS:

1. Charles H Roth,Jr., Fundamentals of Logic Design, 5th Edition, Brooks/cole Cengage Learning, 2004.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

III B.Tech I Sem (E.C.E) **L – T – P– C** **3 – 0 – 0 – 3**

MICROPROCESSORS AND MICROCONTROLLERS
(Open Elective –III)

UNIT I

8086 Architecture: Introduction to Microprocessors based systems, Overview of 8085 microprocessor Architecture, 8086 microprocessor: Main features, pin diagram/description, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration. Overveiw of 80X86 Microprocessor family.

UNIT II

8086 Programming: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT III

8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

UNIT IV

Microcontroller: Architecture of 8051 – Special Function Registers (SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

UNIT V

Interfacing Microcontroller :- Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor, Microcontroller, PIC and ARM processors

Textbooks:

1. Douglas VHall, SSSP Rao, Microprocessors and Interfacing–Programming and Hardware Tata McGraw Hill Education Private Limited, 3rd Edition, 1994.
2. KM Bhurchandi, AK Ray, Advanced Microprocessors and Peripherals,

3rd edition, McGraw Hill Education, 2017.
3. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, 2nd edition, Pearson, 2012.

References:

1. Ramesh S Gaonkar, Microprocessor Architecture Programming and Applications with the 8085, 6th edition, Penram International Publishing, 2013.
2. Kenneth J. Ayala, The 8051Microcontroller, 3rd edition, Cengage Learning, 2004.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

III B.Tech I Sem (E.C.E) **L – T – P– C** **3 – 0 – 0 – 3**

TRANSDUCERS AND SENSORS
(Open Elective –IV)

UNIT I

Introduction: General Configuration and Functional Description of measuring instruments, Static and Dynamic Characteristics of Instrumentation System, Errors in Instrumentation System, Active and Passive Transducers and their Classification.

Motion Transducers: Resistive strain gauge, LVDT, RVDT, Capacitive transducers, Piezo-electric transducers, seismic displacement pick-ups, vibrometers and accelerometers.

UNIT II

Temperature Transducers: Standards and calibration, fluid expansion and metal expansion type transducers - bimetallic strip, Thermometer, Thermistor, RTD, Thermocouple and their characteristics. Hall effect transducers, Digital transducers, Proximity devices, Bio-sensors, Smart sensors, Piezo-electric sensors.

UNIT III

Flow Transducers: Bernoulli's principle and continuity, Orifice plate, Nozzle plate, Venture tube, Rotameter, Anemometers, Electromagnetic flow meter, Impeller meter and Turbid flow meter.

UNIT IV

Pressure Transducers: Standards and calibration, different types of manometers, elastic transducers, diaphragm bellows, bourdon tube, capacitive and resistive pressure transducers, high and low pressure measurement.

UNIT V

Force and Sound Transducers: Proving ring, hydraulic and pneumatic load cell, dynamometer and gyroscopes. Sound level meter, sound characteristics, Microphone.

TEXT BOOKS

1. A.K. Sawhney, —A course in Electrical and Electronics Measurements and Instrumentation‖, Dhanpat Rai& Co. 3rd edition Delhi, 2010.
2. Rangan C.S, Sarma G.R and Mani V S V, —Instrumentation Devices and Systems‖, TATA McGraw Hill publications, 2007.

REFERENCE BOOKS

1. Doebelin. E.O, —Measurement Systems Application and Design‖,McGraw Hill International, New York, 2004.
2. Nakra B.C andChaudharyK.K , —Instrumentation Measurement and

Analysis‖, Second Edition, Tata McGraw-Hill Publication Ltd.2006.

HONOURS WITH VLSI SPECIALIZATION

(For ECE students)

S. No.	Category	Title	L	T	P	Credits
1	PCC	Analog IC Design.	3	0	0	3
2	PCC	Digital IC Design	3	0	0	3
3	PCC	Low power VLSI	3	0	0	3
4	PCC	Testing and Verification	3	0	0	3
5	PCC	FPGA architectures	3	0	0	3
6	PCC	Analog and Digital IC Design Lab	0	0	3	1.5
7	PCC	Physical Design Automation Lab	0	0	3	1.5
Total			**15**	**0**	**06**	**18**

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

Honors with VLSI specialization **L – T – P – C 3–0–0–3**

ANALOG IC DESIGN

UNIT-I

Review of MOSFET device characteristics: Second order effects, MOS small signal Model, Capacitances, body bias effect, Current biasing, voltage biasing, Technology biasing, Relative comparison and limitations.

Basic building blocks and basic cells - Switches, active resistors, Current sources and sinks, Current mirrors: Basic current mirror, cascode current mirror, low voltage current mirror, Wilson and Widlar current mirrors, voltage and current references, Mismatch in accuracies, Design solutions to minimize mismatch in accuracies.

UNIT-II

Single stage amplifier: Analytical justification of operating region suitable for amplification/switching, Design of CS amplifier with different loads, Limitations of diode connected load, Improving output impedance of CS amplifier through feedback ,small signal analyses of common gate and common drain topologies and their frequency response with parasitic affects, significance of cascode, design of cascode amplifier and with ideal current source load and practical cascode load, Limitations of cascode, folded cascode amplifier and design with parasitics.

UNIT-III

Differential amplifier: Significance of differential signaling, Limitations of quasi differential amplifier, Design of differential amplifier with current source load and diode connected load and small signal analyses, errors due to mismatch, replication principle, qualitative analysis, common mode response, gilbert cell, Common centroid layout.

UNIT-IV

Operational amplifier: characterization, two stage OPamp, small signal analysis, Miller compensation , effect of RHP zero on stability, Lead compensation, constant gm biasing, design of biasing circuit independent of process and temperature variations.

UNIT-V

Band Gap Reference: General considerations, Supply independent biasing, temperature-independent references, negative-TC voltage, positive TC voltage, Bandgap reference, PTAT generation, curvature correction, Design of BGR under low voltage conditions.

TEXT BOOKS:

1. Behzad Razavi, Design of Analog CMOS Integrated Circuit, McGraw Hill Education,2017, 2nd Edition.
2. Paul J.Hurst, Paul R.Gray, Robert GM eye rand Stephen H. Lewis, Analysis and Design of Analog Integrated Circuits, Wiley, 2024, 6thEdition.
3. Mohammed Ismail and Terri Fiez, Analog VLSI: Signal and Information Processing, M cGraw Hill, 1994.

REFERENCE BOOKS:

1. Randall L. Geiger, Phillip E. Allen and Noel R.Strader, VLSI Design Techniques for Analog and Digital Circuits, Tata McGraw-Hill Education, 1989.
2. David Johns, Tony Chan Carusone and Kenneth Martin, Analog Integrated Circuit Design, Wiley,2011, 2nd Edition.
3. Paul G.A. Jespers and Boris Murmann, Systematic Design of Analog CMOS Circuits,CambridgeUniversity Press, 2017.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

Honors with VLSI specialization **L – T – P – C 3–0–0–3**

DIGITAL IC DESIGN

UNIT-I

MOS Inverters: Structure and Operation of MOS Transistor (MOSFET), MOSFET Current-Voltage Characteristics, MOSFET Scaling and Small-Geometry Effect, MOSFET Capacitances, CMOS Inverter- Static and switching characteristics, Delay-Time Definitions, Calculation of Delay Times, Inverter Design with Delay Constraints, Estimation of Interconnect Parasitic, Power Consumption in CMOS Gates.

UNIT-II

Designing Combinational & Sequential Logic Gates in CMOS: Static CMOS design- ratioed logic, pass transistor logic, transmission gate logic, Dynamic CMOS Design, Static Latches and Registers, Dynamic Latches and Registers, Alternative Register Styles, Nonbistable Sequential Circuits, Logic Style for Pipelined Structures.

UNIT-III

Timing Issues in Digital Circuits: Introduction, Synchronous Timing basics, Clock Skew and Jitter, Clock distribution techniques, Clock Generation and Synchronization.

UNIT-IV

Designing Arithmetic Building Blocks: Introduction, The Adder: Circuit and Logic Design, Multiplier s: Shifters, Power Considerations in Datapath Structures.

UNIT-V

Designing Memory: Introduction, Semiconductor Memories-An Introduction, The Memory Core: RAM, ROM, Memory Peripheral Circuitry.

TEXT BOOKS:

1. Jan M. Rabaey, Anantha Chandrakasan and Borivoje Nikolic, Digital Integrated Circuits: A Design Perspective, Pearson, 2003, 2nd Edition.
2. John P.Uyemura, CMOS Logic Circuit Design, Springer,2001.
3. John P.Uyemura, Introduction to VLSI Circuits and Systems, Wiley,2002.

REFERENCEBOOKS:

1. Sung-MoKang and Yusuf Leblebici, CMOS Digital Integrated Circuits, McGraw-Hill, 2003,3rd Edition.
2. Charles Hawkins, Jaume Segura and Payman Zarkesh- Ha, CMOS Integrated Digital Electronics: A First Course, IET,2012

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

Honors with VLSI specialization **L – T – P – C 3–0–0–3**

LOW POWER VLSI

UNIT 1

Low Power CMOS VLSI design: Introduction: Sources of Power Dissipation, Static Power Dissipation, Active Power Dissipation.

Circuit Techniques for Low Power Design: Design for Low Power, Multiple Vth techniques, Dynamic Vth techniques.

UNIT II

Adders: Standard Adder Cells, Review of CMOS Adders Architectures and performance Comparison, Low Voltage Low Power Design Techniques, Current Mode Adders.

UNIT III

Multipliers and Memories: Review of Multiplier Architectures, Braun, Booth and Wallace Tree Multipliers and their performance comparison. Sources of power dissipation in SRAMs, Low power SRAM circuit techniques, Sources of power dissipation in DRAMs, Low power DRAM circuit techniques.

UNIT IV

Architectural Techniques for Low Power: Parameters effecting power dissipation, Variable frequency, Dynamic voltage Scaling, Dynamic Voltage and Frequency Scaling, Reduced VDD, Architectural clock gating, Power gating, Multi-voltage, Optimizing memory power.

UNIT V

Low Power Implementation Techniques: Library Selection, Clock Gating, Timing Impact due to Clock gating, Gate-level power optimization techniques, Power Optimization for Sleep Mode.

Textbooks:

1. Kiat Seng Yeo and Kaushik Roy, Low-Voltage, Low-Power VLSI Subsystems, Tata McGraw Hill,2009.
2. Soudris D, Piguet C and Goutis C, Designing CMOS Circuits for Low Power, Kluwer Academic Publishers, 2002.

References:

1. Abdellatif Bellaouar, Mohamed Elmasry, Low- Power Digital VLSI Design: Circuits and Systems, Springer,2012.
2. Jan Rabaey, Low Power Design Essentials, Springer, 2009.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

Honors with VLSI specialization **L – T – P– C 3 – 0 – 0 – 3**

TESTING AND VERIFICATION

UNIT I

Role of testing in VLSI Design flow, Testing at different levels of abstraction, Fault, error, defect, diagnosis, yield, Types of testing, Rule of Ten, Defects in VLSI chip. Modelling basic concepts, Functional modelling at logic level and register level, structure models, logic simulation, delay models. Various types of faults, Fault equivalence and Fault dominance in combinational sequential circuits.

UNIT II

Fault simulation applications, General fault simulation algorithms- Serial, and parallel, Deductive fault simulation algorithms.

UNIT III

Combinational circuit test generation, Structural Vs Functional test, ATPG, Path sensitization methods. Difference between combinational and sequential circuit testing, five and eight valued algebra, and Scan chain-based testing method.

UNIT IV

D-algorithm procedure, Problems, PODEM Algorithm. Problems on PODEM Algorithm. FAN Algorithm. Problems on FAN algorithm, Comparison of D, FAN and PODEM Algorithms. Design for Testability, Ad- hoc design, Generic scan-based design.

UNITV

Classical scan-based design, System level DFT approaches Test pattern generation for BIST, Circular BIST. BIST Architectures. Testable memory design – Test algorithms- Test generation for Embedded RAMs.

Textbooks:

1. M. Abramovici, M. Breuer, and A. Friedman, — Digital Systems Testing and Testable Design, IEEE Press, 1990.
2. M. Bushnell and V. Agrawal, —Essentials of Electronic Testing for Digital, Memory & Mixed-Signal VLSI Circuits, Kluwer Academic Publishers, 2000

References:

1. Stroud, —A Designer's Guide to Built-in Self-Test, Kluwer Academic Publishers, 2002
2. V. Agrawal and S.C. Seth, Test Generation for VLSI Chips, Computer Society Press.1989

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

Honors with VLSI specialization **L – T – P – C 3–0–0–3 FPGA**

ARCHITECTURES

UNIT I

Introduction to FPGAs: Evolution of programmable devices, FPGA Design flow, Applications of FPGA.

UNITII

Design Examples using PLDs: Design of Universal block, Memory, Floating point multiplier, Barrel shifter.

UNITIII

FPGAs/CPLDs: Programming Technologies, Commercially available FPGAs, Xilinx's Vertex and Spartan, Actel's FPGA, Altera's FPGA/CPLD.

UNITIV

Building blocks of FPGAs/CPLDs: Configurable Logic block functionality, Routing structures, Input/output Block, Impact of logic block functionality on FPGA performance, Model for measuring delay.

UNITV

Routing Architectures: Routing terminology, general strategy for routing in FPGAs, routing for row – based FPGAs, introduction to segmented channel routing, routing for symmetrical FPGAs, example of routing in asymmetrical FPGA, general approach to routing in symmetrical FPGAs, independence from FPGA routing architectures, FPGA routing structures. FPGA architectural assumptions, the logic block, the connection block, connection block topology, the switch block, switch block topology, architectural assumptions for the FPGA

CASESTUDY–ApplicationsusingKintex-7,Viretex-7,Artix-7.

Textbooks:

1. John V. Oldfield and Richard C. Dorf, Field Programmable Gate Arrays: Reconfigurable Logic for Rapid Prototyping and Implementation of Digital Systems, Wiley-Inter science, 1995, 1st Edition.
2. Frank Bruno, FPGA Programming for Beginners, Packt, 2021.
3. Frank Bruno and Guy Eschemann, The FPGA Programming Handbook, Packt, 2024,2nd Edition.
4. Stephen D. Brown, Robert J. Francis, Jonathan Rose and Zvonko G. Vranesic, Field Programmable Gate Arrays, Springer Science+Business Media, LLC, 1992, 1st Edition.

References:

1. Clive Max field, The Design Warrior's Guide to FPGAs: Devices, Tools and Flows, Elsevier-Newnes, 2004.
2. Data sheets of Artix-7, Kintex-7, Virtex-7.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

Honours with VLSI specialization **L – T – P – C 0–0–3–1.5**

ANALOG AND DIGITAL IC DESIGN LAB

List of Experiments:

Any five experiments from each group (All circuits till post layout) Analog IC Design Lab

1. Lambda calculation for PMOS & NMOS, Transconductance plots
2. Single transistor amplifier with different loads
3. CS amplifier with source degeneration
4. Cascode amplifier
5. Basic current sink, Cascode current sink
6. Basic current source, Cascode current source
7. Basic current mirror, Wilson current mirror
8. Cascode current mirror
9. Feedback topologies
10. CMOS differential amplifier with current mirror load.
11. Two stage Operational amplifier.

Digital IC Design Lab

1. Design and Simulation of CMOS Inverter to study the transfer Characteristics by varying the design constraints using EDA Tools
2. Design and Simulation of logic gates using various logic styles and compare the performance

Design the following building blocks employing various architectures and develop HDL models:

3. 32-bit Parallel adder using 8-bit adder module
4. 32-bit Shift register using 8-bit Shift register module
5. Combinational and sequential multipliers :8x8 multiplier
6. Combinational and sequential multipliers :16X16 multipliers
7. Perform the functional simulation, Static Timing Analysis and post synthesis timing verification RTL to GDS-II: Design any System as a case Study

Text Books:

1. Behzad Razavi, Design of Analog CMOS Integrated Circuit, Mc Graw Hill Education, 2017, 2ndEdition.
2. Paul J. Hurst, Paul R. Gray, Robert G Meyer and Stephen H. Lewis, Analysis and Design of Analog Integrated Circuits, Wiley, 2024, 6th Edition.
3. Samir Palnitkar, Verilog HDL, Pearson Education, 2003, 2nd Edition.
4. Erik Brunvand, Digital VLSI Chip Design with Cadence and Synopsys CAD Tools, Pearson, 2011.

Reference Books:

1. Randall L. Geiger, Phillip E. Allen and Noel R. Strader, VLSI Design Techniques for Analog and Digital Circuits, Tata McGraw-Hill Education, 1989.
2. David Johns, Tony Chan Carusone and Kenneth Martin, Analog Integrated Circuit Design

Wiley, 2011, 2nd Edition.
3. Joseph Cavanagh, Verilog HDL Design Examples, CRC Press, 2018.
4. Blaine Readler, Verilog by Example: A Concise Introduction for FPGA Design, Full ARC Press,2011.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

Honors with VLSI specialization **L – T – P – C 0–0–3–1.5**

PHYSICAL DESIGN AUTOMATION LAB

List of Experiments: Any ten experiments are to be conducted (Minimum one from each group)

I. Graph algorithms
   1. Graph search algorithms
      - Depth first search
      - Breadth first search
   2. Spanning tree algorithm
      - Kruskal's algorithm
   3. Shortest path algorithm
      - Dijkstra algorithm
      - Floyd-Warshall algorithm
   4. Steiner tree algorithm

II. Computational geometry algorithm
   1. Line sweep method
   2. Extended line sweep method

III. Partitioning algorithms
   1. Group migration algorithms
      - Kernighan–Lin algorithm
      - Extensions of Kernighan-Lin algorithm
        - Fiduccias–Mattheyses algorithm
        - Goldberg and Burstein algorithm
   2. Simulated annealing and evolution algorithms
      - Simulated annealing algorithm
      - Simulated evolution algorithm
   3. Metric allocation method

IV. Floor planning algorithms
   1. Constraint based methods
   2. Integer programming-based methods
   3. Rectangular dualization based methods
   4. Hierarchical tree-based methods
   5. Simulated evolution algorithms
   6. Time driven Floor planning algorithms

V. Routing algorithms
   1. Two terminal algorithms
      - Maze routing algorithms

    - Lee's algorithm
    - Soukup's algorithm
    - Hadlock algorithm
  - Line-Probe algorithm
  - Shortest path based algorithm
2. Multi terminal algorithm
  - Stenier tree based algorithm
    - SMST algorithm
    - Z-RST algorithm

Minor in ECE
(Offered by ECE to other departments)

S.No.	Category	Title	L	T	P	Credi
1	PCC	Electronic Circuits	3	0	0	3
2	PCC	Digital Electronics	3	0	0	3
3	PCC	Principles of Communication Engineering	3	0	0	3
4	PCC	Electronic Instrumentation	3	0	0	3
5	PCC	Microprocessors and Microcontrollers	3	0	0	3
6	PCC	Electronic Circuits and Digital Electronics Lab	0	0	3	1.5
7	PCC	Microprocessors and Microcontrollers Lab	0	0	3	1.5
Total			**15**	**0**	**06**	**18**

L – T – P – C 3–0–0–3

ELECTRONIC CIRCUITS

UNIT-I

Semiconductor Diode and Applications: Introduction, PN junction diode – structure, operation and VI characteristics, Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Positive and Negative Clipping and Clamping circuits (Qualitative treatment only).

Special Diodes: Zener and Avalanche Breakdowns, VI Characteristics of Zener diode, Zener diode as voltage regulator, Construction, operation and VI characteristics of Tunnel Diode, LED, Varactor Diode, Photo Diode.

UNIT-II

Bipolar Junction Transistor (BJT): Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch and Amplifier, Transistor Biasing and Stabilization - Operating point, DC & AC load lines, Biasing - Fixed Bias, Self Bias, Bias Stability, Bias Compensation using Diodes.

UNIT-III

Single stage amplifiers: Classification of Amplifiers - Distortion in amplifiers, Analysis of CE, CC and CB configurations with simplified hybrid model.

Multistage amplifiers: Different Coupling Schemes used in Amplifiers – RC coupled amplifiers, Transformer Coupled Amplifier, Direct Coupled Amplifier; Multistage RC coupled BJT amplifier (Qualitative treatment only).

UNIT-IV

Feedback amplifiers: Concepts of feedback, Classification of feedback amplifiers, Effect of feedback on amplifier characteristics, Voltage Series, Voltage Shunt, Current Series and Current Shunt Feedback Configurations (Qualitative treatment only).

Oscillators: Classification of oscillators, Condition for oscillations, RC Phase shift Oscillators, Generalized analysis of LC Oscillators-Hartley and Colpitts Oscillators, Wien Bridge Oscillator.

UNIT-V

Op-amp: Classification of IC'S, basic information of Op-amp, ideal and practical Op-amp, 741 op-amp and its features, modes of operation-inverting, non-inverting, differential.

Applications of op-amp: Summing, scaling and averaging amplifiers, Integrator, Differentiator, phase shift oscillator and comparator.

TEXT BOOKS:

1. Electronics Devices and Circuits, J. Millman and Christos. C. Halkias,3rd edition, Tata McGraw Hill, 2006.
2. Electronics Devices and Circuits Theory, DavidA.Bell,5th Edition, Oxford University press. 2008.

REFERENCEBOOKS:

1. Electronics Devices and Circuits Theory, R.L. Boylestad, Lousis Nashelsky and K. Lal Kishore, 12th edition, 2006, Pearson, 2006.
2. Electronic Devices and Circuits, N.Salivahanan, and N.Suresh Kumar, 3rd Edition, TMH, 2012
3. Microelectronic Circuits, S.Sedra and K.C. Smith,5th Edition, Oxford University Press.

L – T – P – C 3–0–0–3

DIGITAL ELECTRONICS

UNIT-I

Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Introduction to Logic Gates, Ex-OR, Ex-NOR operations, Minimization of Switching Functions: Karnaugh map method, Logic function realization: AND-OR, OR-AND and NAND/NOR realizations.

UNIT-II

Introduction to Combinational Design 1: Binary Adders, Subtractors and BCD adder, Code converters - Binary to Gray, Gray to Binary, BCD to excess3, BCD to Seven Segment display.

UNIT-III

Combinational Logic Design 2: Decoders, Encoders, Priority Encoder, Multiplexers, Demultiplexers, Comparators, Implementations of Logic Functions using Decoders and Multiplexers.

UNIT-IV

Sequential Logic Design: Latches, Flip-flops, S-R, D, T, JK and Master-Slave JK FF, Edge triggered FF, set up and hold times, Ripple counters, Shift registers.

UNIT-V

Programmable Logic Devices: ROM, Programmable Logic Devices (PLA and PAL).

Digital IC's: Decoder(74x138), Priority Encoder (74x148), multiplexer (74x151) and de-multiplexer (74x155), comparator (74x85).

TEXT BOOKS:

1. Digital Design, M. Morris Mano & Michel D. Ciletti, 5th Edition, Pearson Education, 1999.
2. Switching theory and Finite Automata Theory, Zvi Kohavi and Nirah K. Jha, 2nd Edition, Tata McGraw Hill, 2005.

REFERENCE BOOKS:

1. Fundamentals of Logic Design, Charles H Roth, Jr.,5th Edition, Brooks/cole Cengage Learning, 2004.

L – T – P – C 3–0–0–3

PRINCIPLES OF COMMUNICATION ENGINEERING

UNIT I:

Analog communication-I: Elements of communication systems, need for Modulation, Modulation Methods, Baseband and carrier communication Amplitude Modulation (AM), Generation of AM signals, Rectifier detector, Envelope detector, sideband and carrier power of AM, Double side band suppressed carrier (DSB-SC) modulation & its demodulation, Switching modulators, Ring modulator, Balanced modulator, Single sideband (SSB) transmission, VSB Modulation.

UNIT II:

Analog communication-II: Angle Modulation & Demodulation: Concept of instantaneous frequency Generalized concept of angle modulation, Bandwidth of angle modulated waves- Narrow band frequency modulation (NBFM); and Wide band FM (WBFM), Phase modulation, Pre-emphasis & De-emphasis, Illustrative Problems.

UNIT III:

Digital communications-I (Qualitative Approach only): Pulse Analog Modulation Techniques: Pulse analog modulation techniques, Generation and detection of Pulse amplitude modulation, Pulse width modulation, Pulse position modulation

Multiple Access Techniques: Introduction to multiple access techniques, FDMA, TDMA, CDMA, SDMA: Advantages and applications

UNIT IV:

Digital communications-II (Qualitative Approach only): Pulse Code Modulation, DPCM, Delta modulation, Adaptive delta modulation, Overview of ASK, PSK, QPSK, BPSK and M- PSK techniques.

UNIT V:

Wireless communications (Qualitative Approach only): Introduction to wireless communication systems, Examples of wireless communication systems, comparison of 2G and 3Gcellular networks, Introduction to wireless networks, Differences between wireless and fixed telephone networks, Introduction to Global system for mobile (GSM), GSM services and features.

TEXT BOOKS

1. H Taub, D. Schillingand Gautam Sahe, —Principles of Communication Systems, TMH, 2007,3rd Edition.
2. George Kennedy and Bernard Davis, —Electronics&CommunicationSystem‖,4th Edition, TMH 2009.
3. Wayne Tomasi, Electronic Communication System: Fundamentals Through Advanced‖,2nd edition, PHI,2001.

REFERENCE BOOKS

1. Simon Haykin, —Principles of Communication Systems, John Wiley, 2nd Edition.
2. Sham Shanmugam, —Digital and Analog communication Systems, Wiley-India edition,2006.
3. Theodore. S.Rapport,—Wireless Communications, Pearson Education,2nd Edition,2002.

L – T – P – C 3–0–0–3

ELECTRONIC INSTRUMENTATION

UNIT I

Measuring Instruments: Introduction, Errors in Measurement, Accuracy, Precision, Resolution and Significant figures. Basic PMMC Meter- construction and working, DC and AC Voltmeters-Multirange, Range extension, DC Ammeter, Multimeter for Voltage, Current and resistance measurements.

Digital Instruments: Digital Voltmeters – Introduction, DVM's based on V–T, V–F and Successive approximation principles, Resolution and sensitivity, General specifications, Digital Multimeters, Digital frequency meters, Digital measurement of time.

UNIT II

Oscilloscopes: Introduction, Block diagram of CRO, Basic principle of CRT, CRT Construction and features, vertical amplifiers, horizontal deflection system- sweep, trigger pulse, delay line, sync selector circuits. Dual beam and dual trace CROs, Sampling and Digital storage oscilloscopes.

UNIT III

Bridges: DC Bridges for Measurement of resistance - Wheat stone bridge, Kelvin's Bridge, AC Bridges for Measurement of inductance- Maxwell's bridge, Hay's Bridge, Anderson bridge, Measurement of capacitance - Schearing Bridge, Wien Bridge, Errors and precautions in using bridges.

UNIT IV

Signal Generators: Introduction, Fixed and variable AF oscillator, Standard signal generator, Laboratory type signal generator, AF sine and square wave generator, Function generator, Square and Pulse generator, Sweep frequency generator.

UNIT V

Transducers: Introduction, Types of Transducers, Electrical transducers, Selecting a transducer, Resistive transducer, Strain gauges, Piezoelectric transducer, Photoelectric transducer, Photovoltaic transducer, Temperature transducers-RTD, LVDT.

TEXT BOOKS

1. H.S.Kalsi,—Electronic Instrumentation, Third edition, Tata McGraw Hill,2010.
2. A.D.Helfrick and W.D.Cooper,—Modern Electronic Instrumentation and Measurement Techniques‖, PHI, 6th Edition, 2010.

REFERENCE BOOKS

1. A.K. Sawhney, Dhanpat Rai & Co., —A course in Electrical and Electronic Measurements and Instrumentation‖, 9th Edition, 2010.
2. DavidA. Bell, —Electronic Instrumentation & Measurements, PHI, 2nd Edition,2006.

L – T – P – C 3–0–0–3

MICROPROCESSORS AND MICROCONTROLLERS

UNIT I

8086 Architecture: Main features, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration.

UNIT II

8086 Programming: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT III

8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255programmable peripheral interface, Interfacing switches and LEDS, Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

UNIT IV

Microcontroller - Architecture of 8051 – Special Function Registers (SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

UNIT V

Interfacing Microcontroller - Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor, Microcontroller, PIC and ARM processors

Textbooks:

1. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rdEdition,1994.
2. KM Bhurchandi, AK Ray, Advanced Microprocessors and Peripherals, 3rdedition, McGraw Hill Education, 2017.
3. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, 2nd edition, Pearson, 2012.

References:

1. Ramesh S Gaonkar, Microprocessor Architecture Programming and Applications with the8085, 6th edition, Penram International Publishing, 2013.
2. KennethJ. Ayala, The 8051 Microcontroller, 3rd edition, Cengage Learning,2004.

L – T – P – C 0-0–3–1.5

ELECTRONIC CIRCUITS AND DIGITAL ELECTRONICS LAB

ELECTRONIC CIRCUITS

List of Experiments:(Any 06 Experiments are to be conducted)

1. P-N Junction Diode Characteristics
2. Zener Diode as voltage regulator
3. Half Wave Rectifiers (without and with filter)
4. Full Wave Rectifiers (without and with filter)
5. CB Characteristics
6. CE Characteristics
7. CE Amplifier
8. CC Amplifier
9. Clippers
10. Clampers
11. Hartley & Colpitt's Oscillators.
12. Op-Amp Applications-Adder, subtractor, comparator

DIGITAL ELECTRONICS LAB

List of Experiments:(Any 6 Experiments are to be conducted)

1. Realization of Boolean Expressions using Gates
2. Design and realization of logic gates using universal gates
3. Generation of clock using NAND/ NOR gates
4. Designa4–bit Adder/Subtractor
5. Design and realization ofa4– bit Grayto Binary and Binary to Gray Converter
6. Design and realization of8x1 MUXusing2x1 MUX
7. Design andrealizationof4bitcomparator
8. Design and realization of Flip-Flops.
9. Design and realization of Encoders
10. Design and realization of Decoders
11. Design and realization of Comparator.

L – T – P– C 0-0 – 3 – 1.5

MICROPROCESSORS AND MICROCONTROLLERS LAB

List of Experiments:(Any TEN of the experiments are to be conducted)

1. **Programs for16Bit Arithmetic Operations** (Using various addressing modes)
a) WriteanALPtoPerformAdditionandSubtractionofMultiprecisionnumbers.
b) Write an ALP to Perform Multiplication and division of signed and unsigned Hexadecimal numbers.
c) Write an ALP to find square, cube and factorial of a given number.
2. **Programs Involving Bit Manipulation Instructions**
a) Write an ALP to find the given data is positive or negative.
b) Write an ALP to find the given data is odd or even.
c) Write an ALP to find Logical ones and zeros in a given data.
3. **Programs on Arrays for 8086**
a) Write an ALP to find Addition/subtraction of N no.s.
b) Write an ALP for finding largest/smallest no.
c) Write an ALP to sort given array in Ascending/descending order.
4. **Programs on String Manipulations for 8086**
a) Write an ALP to find String length.
b) Write an ALP for Displaying the given String.
c) Write an ALP for Comparing two Strings.
d) Write an ALP to reverse String and Checking for palindrome.
5. **Programs for Digital Clock Design Using 8086**
a) Write an ALP for Designing clock using INT21H Interrupt.
b) Write an ALP for Designing clock using DOS Interrupt Functions.
c) Write an ALP for Designing clock by reading system time.
6. **Interfacing Stepper Motor with 8086**
a) Write an ALP to 8086 processor to Interface a stepper motor and operate it in clockwise by choosing variable step-size.
b) Write an ALP to 8086 processor to Interface a stepper motor and operate it in Anti- clockwise by choosing variable step-size.
7. **Interfacing ADC/DAC with 8086**
a) Write an ALP to 8086 processor to Interface ADC.
b) Write an ALP to 8086 processor to Interface DAC and generate Square Wave/Triangular Wave/Step signal.
8. **Communication between Two Microprocessors**
a) Write an ALP to have Parallel communication between two microprocessors using 8255
b) Write an ALP to have Serial communication between two microprocessor kits using8251.
9. **ProgramsusingArithmeticandLogicalInstructionsfor8051**
a) WriteanALPto8051MicrocontrollertoperformArithmeticoperationslikeaddition, subtraction,
b) Multiplication and Division.
c) WriteanALPto8051Microcontroller to perform Logical operations like AND, OR and XOR.
d) Programs related to Register Banks.
10. **Programs to Verify Timers/Countersof8051**
a) Write a program to create a delay of 25msec using Timer0 in mode 1 and blink all the Pins of P0.
b) Write a program to create a delay of 50 μsec using Timer1 in mode 0 and blink all the Pins of

P2.

c) Write a program to create a delay of 75msec using counter0 in mode 2 and blink all the Pins of P1.

d) Write a program to create a delay of 80 μsec using counter1 in mode 1 and blink all the Pins of P3.

11. UART Operation in 8051

a) Write a program to transfer a character serially with a baud rate of 9600 using UART.

b) Write a program to transfer a character serially with a baud rate of 4800 using UART.

c) Write a program to transfer a character serially with a baud rate of 2400 using UART.

12. Interfacing LCD with 8051

a) Develop and execute the program to interface16*2 LCD to 8051.

b) Develop and execute the program to interface LCD to 8051in 4-bitor8-bit mode.

Reference Books:

1. Kenneth. J.Ayala. The 8051microcontroller, 3rd edition, Cengage learning,2010.
2. Advanced microprocessors and peripherals-A.Kray and K.M.Bhurchandani, TMH, 2nd edition 2006.
3. The8051Microcontroller and Embedded Systems: Using Assembly and C by Muhammad AliMazidi, Janice Gillispie Mazidi, Second Edition.

Course structure and Syllabus for the service courses offered by ECE department as requested by Head EEE department

III B.Tech I Semester (E.E.E)						
S.No.	**Course code**	**Title**	**L**	**T**	**P**	**Credits**
1		Digital Circuits **(Professional Core)**	3	0	0	3
2		Signals & Systems**(Professional Elective -I)**	3	0	0	3
3		Analog and Digital Circuits Lab	0	0	3	1.5

III B.Tech II Semester(E.E.E)						
S.No.	**Course code**	**Title**	**L**	**T**	**P**	**Credits**
1		Microprocessors and Microcontrollers **(Professional Core)**	3	0	0	3
2		Communication Systems **(Professional Elective-III)**	3	0	0	3
3		Microprocessors and Microcontrollers Lab **(Professional Core)**	0	0	3	1.5

IV B.Tech I Semester(E.E.E)						
S.No.	**Course code**	**Title**	**L**	**T**	**P**	**Credits**
1		Digital Signal Processing **(Professional Elective - IV)**	3	0	0	3

	DIGITAL CIRCUITS Professional Core)	L	T	P	C
		3	0	0	3

III Year B.Tech. EEE – I Semester **R23 Regulation**

UNIT -I

Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Introduction to Logic Gates, Ex-OR, Ex-NOR operations, Minimization of Switching Functions: Karnaugh map method, Logic function realization: AND-OR, OR-AND and NAND/NOR realizations.

UNIT-II

Introduction to Combinational Design 1: Binary Adders, Subtractors and BCD adder, Code converters - Binary to Gray, Gray to Binary, BCD to excess3, BCD to Seven Segment display.

UNIT-III

Combinational Logic Design 2: Decoders, Encoders, Priority Encoder, Multiplexers, Demultiplexers, Comparators, Implementations of Logic Functions using Decoders and Multiplexers.

UNIT-IV

Sequential Logic Design: Latches, Flip-flops, S-R, D, T, JK and Master-Slave JK FF, Edge triggered FF, set up and hold times, Ripple counters, Shift registers.

UNIT-V

Programmable Logic Devices: ROM, Programmable Logic Devices (PLA and PAL).

Digital IC's: Decoder (74x138), Priority Encoder (74x148), multiplexer (74x151) and de-multiplexer (74x155), comparator (74x85).

TEXT BOOKS:

1. M.Morris Mano & Michel D. Ciletti, Digital Design, 5th Edition, Pearson Education, 1999.

2. Zvi Kohavi and Nirah K.Jha, Switching theory and Finite Automata Theory, 2nd Edition, Tata McGraw Hill, 2005.

REFERENCE BOOKS:

1. Charles H Roth,Jr., Fundamentals of Logic Design, 5th Edition, Brooks/cole Cengage Learning, 2004.

	SIGNALS AND SYSTEMS (Professional Elective -I)	L	T	P	C
		3	0	0	3

UNIT I

Signals and Systems : Continuous and Discrete Time Signals, Transformations of the Independent Variable, Elementary Signals-Unit Impulse, Unit Step Functions, Ramp Signal, Rectangular function, Signum Function, Sinc & Sa Function, Exponential and Sinusoidal Signals, Classification of Signals & Systems, Continuous and Discrete Time Systems, Basic System Properties, Linear Time Invariant (LTI) Systems, Discrete-Time LTI Systems, Convolution Sum, Continuous Time LTI Systems, Convolution Integral, Properties of LTI Systems, Causal LTI Systems described by Differential and Difference Equations, Singularity Functions.

UNIT II

Fourier series representation of periodic signals: Response of LTI Systems to Complex Exponentials. Fourier Series Representation of Continuous Time Periodic Signals, Trigonometric, Polar, Exponential fourier Series & related problems, Convergence of the Fourier Series, Properties of Continuous Time Fourier Series, Fourier Series Representation of Discrete Time Periodic Signals, Properties of Discrete Time Fourier Series, Fourier Series and LTI Systems,

UNIT III

The Continuous-Time Fourier Transform: Representation of aperiodic Signals, Continuous Time Fourier Transform, Fourier Transform for Periodic Signals, Properties of the Continuous Time Fourier Transform, Systems characterized by Linear constant coefficient differential equations, Discrete Time Fourier Transform - Representation of Aperiodic Signals, Discrete Time Fourier Transform, Frequency Response, Systems Characterized by Linear Constant-Coefficient Difference Equations.

UNIT IV

Time & Frequency Characterization of Signals and Systems : The Magnitude Phase Representation of the Fourier Transform, Magnitude Phase Representation of the Frequency Response of LTI Systems, Time-Domain Properties of Ideal Frequency Selective Filters, Time Domain and Frequency Domain Aspects of Non-ideal Filters, Examples of Continuous time filters and Discrete time filters described by differential equations, First-Order and Second-Order Continuous and Discrete-Time Systems, Examples of Time and Frequency Domain Analysis of Systems,

Sampling: Representation of a Continuous Time Signal by Its Samples, Sampling Theorem, Reconstruction of a Signal from Its Samples Using Interpolation, Effect of under sampling: Aliasing, Discrete Time Processing of Continuous-Time Signals.

UNIT V

Laplace and z-Transforms : The Laplace Transform, Region of Convergence for Laplace Transforms, Inverse Laplace Transform, Geometric Evaluation of the Fourier Transform from the Pole-Zero Plot, Properties of the Laplace Transform, Some Laplace Transform Pairs, Analysis and Characterization of LTI Systems Using the Laplace Transform, System Function Algebra and Block Diagram Representations, Unilateral Laplace Transform, Z-Transform - Region of Convergence for the z-Transform, Inverse z-Transform, Geometric Evaluation of the Fourier Transform from the Pole-Zero Plot, Properties of the z-Transform, Some Common z-Transform Pairs, Analysis and Characterization of LTI Systems Using z-Transforms, System Function Algebra and Block Diagram Representations, Unilateral z-Transforms.

TEXT BOOKS:

1. Alan V. Oppenheim, Alan S. Willsky, & S. Hamid, Signals and Systems, 2nd Edition, Pearson Higher Education, 1997.

2. B.P. Lathi, Principles of Linear Systems and Signals, 2nd Edition, Oxford University Press, 2011.

REFERENCE BOOKS:

1. Simon Haykin and B. Van Veen, Signals & Systems, 2nd Edition, John Wiley, 2003.

2. Narayana Iyer and K Satya Prasad, Signals and systems, 1st Edition, CENGAGE Learning, 2011.

3. C. L. Philips, J. M. Parr and Eve A. Riskin, Signals, Systems and Transforms, 4th Edition, Pearson education, 2008.

	ANALOG AND DIGITAL CIRCUITS LAB	L	T	P	C
		0	0	3	1.5

ANALOG CIRCUITS List of Experiments: (Any 06 Experiments are to be conducted)

1. CB Characteristics
2. CE Characteristics
3. CE Amplifier
4. CC Amplifier
5. Clippers
6. Clampers
7. Hartley & Colpitt's Oscillators.
8. RC Phase shift oscillator
9. Astable multivibrator
10. Monostable multivibrator
11. A to D Convertor
12. D to A Convertor
13. Op-Amp Applications-Adder, subtractor, comparator

DIGITAL CIRCUITS List of Experiments: (Any 6 Experiments are to be conducted)

1. Realization of Boolean Expressions using Gates
2. Design and realization of logic gates using universal gates
3. Generation of clock using NAND / NOR gates
4. Design a 4 – bit Adder / Subtractor
5. Design and realization of a 4 – bit Gray to Binary and Binary to Gray Converter
6. Design and realization of 8x1 MUX using 2x1 MUX
7. Design and realization of 4 bit comparator
8. Design and realization of Flip-Flops.
9. Design and realization of Encoders
10. Design and realization of Decoders
11. Design and realization of Comparator.

III Year B.Tech. EEE – II Semester R23 Regulation

	MICROPROCESSORS AND MICROCONTROLLERS (Professional Core)	L	T	P	C
		3	0	0	3

UNIT I

8086 Architecture: Introduction to Microprocessors based systems, Overview of 8085 microprocessor Architecture, 8086 microprocessor: Main features, pin diagram/description, Internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration. Overview of 80X86 Microprocessor family.

UNIT II

8086 Programming: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT III

8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

UNIT IV

Microcontroller : Architecture of 8051 – Special Function Registers (SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

UNIT V

Interfacing Microcontroller: Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor, Microcontroller, PIC and ARM processors

Textbooks:

1. Douglas VHall, SSSP Rao, Microprocessors and Interfacing–Programming and Hardware Tata McGraw Hill Education Private Limited, 3rd Edition, 1994.
2. KM Bhurchandi, AK Ray, Advanced Microprocessors and Peripherals, 3rd edition, McGraw Hill Education, 2017.
3. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, 2nd edition, Pearson, 2012.

References:

1. Ramesh S Gaonkar, Microprocessor Architecture Programming and Applications with the 8085, 6th edition, Penram International Publishing, 2013.
2. Kenneth J. Ayala, The 8051Microcontroller, 3rd edition, Cengage Learning, 2004.

	COMMUNICATION SYSTEMS (Professional Elective-III)	L	T	P	C
		3	0	0	3

UNIT I

Analog communication-I: Elements of communication systems, need for Modulation, Modulation Methods, Baseband and carrier communication Amplitude Modulation (AM), Generation of AM signals, Rectifier detector, Envelope detector, sideband and carrier power of AM, Double side band suppressed carrier (DSB-SC) modulation & its demodulation, Switching modulators, Ring modulator, Balanced modulator, Single sideband (SSB) transmission, VSB Modulation.

UNIT II

Analog communication-II: Angle Modulation & Demodulation: Concept of instantaneous frequency Generalized concept of angle modulation, Bandwidth of angle modulated waves-Narrow band frequency modulation (NBFM); and Wide band FM (WBFM), Phase modulation, Pre-emphasis & De-emphasis, Illustrative Problems.

UNIT III

Digital communications-I (Qualitative Approach only): Pulse analog modulation techniques, Generation and detection of Pulse amplitude modulation, Pulse width modulation, Pulse position modulation

Multiple Access Techniques: Introduction to multiple access techniques, FDMA, TDMA, CDMA, SDMA: Advantages and applications

UNIT IV

Digital communications-II (Qualitative Approach only): Pulse Code Modulation, DPCM, Delta modulation, Adaptive delta modulation, Overview of ASK, PSK, QPSK, BPSK and M-PSK techniques.

UNIT V

Wireless communications (Qualitative Approach only): Introduction to wireless communication systems, Examples of wireless communication systems, comparison of 2G and 3G cellular networks, Introduction to wireless networks, Differences between wireless and fixed telephone networks, Introduction to Global system for mobile (GSM), GSM services and features.

TEXT BOOKS

1. H Taub, D. Schilling and Gautam Sahe, —Principles of Communication Systems‖, TMH, 2007, 3rd Edition.
2. George Kennedy and Bernard Davis, —Electronics & Communication System‖, 4th Edition, TMH 2009.
3. Wayne Tomasi, —Electronic Communication System: Fundamentals Through Advanced‖, 2nd edition, PHI,2001.

REFERENCE BOOKS

1. Simon Haykin, —Principles of Communication Systems‖, John Wiley, 2nd Edition.
2. Sham Shanmugam, —Digital and Analog communication Systems‖, Wiley-India edition,2006.
3. Theodore. S.Rapport, —Wireless Communications‖, Pearson Education, 2nd Edition,2002.

III Year B.Tech. EEE – II Semester **R23 Regulation**

	MICROPROCESSORS AND MICROCONTROLLERS LAB (Professional Core)	L	T	P	C
		0	0	3	1.5

1. Programs for 16 Bit Arithmetic Operations (Using various addressing modes)
   a) Write and execute an ALP to Perform Addition and Subtraction of Multi-precision numbers.
   b) Write and execute an ALP to Perform Multiplication and division of signed and unsigned Hexadecimal numbers.
   c) Write and execute an ALP to find square, cube and factorial of a given number.
2. Programs Involving Bit Manipulation Instructions
   a) Write and execute an ALP to find the given data is positive or negative.
   b) Write and execute an ALP to find the given data is odd or even.
   c) Write and execute an ALP to find Logical ones and zeros in a given data.
3. Programs on Arrays for 8086
   a) Write and execute an ALP to find Addition/subtraction of N numbers.
   b) Write and execute an ALP for finding largest/smallest No.
   c) Write and execute an ALP to sort given array in Ascending/descending order.
4. Programs on String Manipulations for 8086
   a) Write and execute an ALP to find String length.
   b) Write and execute an ALP for Displaying the given String.
   c) Write and execute an ALP for Comparing two Strings.
   d) Write and execute an ALP to reverse String and Checking for palindrome.
5. Programs for Digital Clock Design Using 8086
   a) Write and execute an ALP for Designing clock using INT21H Interrupt.
   b) Write and execute an ALP for Designing clock using DOS Interrupt Functions.
   c) Write and execute an ALP for Designing clock by reading system time.
6. Interfacing Stepper Motor with 8086
   a) Write and execute an ALP to 8086 processor to Interface a stepper motor and operate it in clockwise by choosing variable step-size.
   b) Write and execute an ALP to 8086 processor to Interface a stepper motor and operate it in Anti-clockwise by choosing variable step-size.
7. Interfacing ADC/DAC with8086
   a) Write and execute an ALP to 8086 processor to Interface ADC.
   b) Write and execute an ALP to 8086 processor to Interface DAC and generate Square Wave/ Triangular Wave/ Step signal.
8. Communication between Two Microprocessors
   a) Write and execute an ALP to have Parallel communication between two microprocessors using 8255
   b) Write and execute an ALP to have Serial communication between two microprocessor kits using 8251.
9. Programs using Arithmetic and Logical Instructions for 8051
   a) Write and execute an ALP to 8051 Microcontroller to perform Arithmetic operations like addition, subtraction, Multiplication and Division.
   b) Write and execute an ALP to 8051 Microcontroller to perform Logical operations like AND, OR and XOR.
   c) Programs related to Register Banks.

10. Programs to Verify Timers/Counters of 8051
    a) Write and execute a program to create a delay of 25msec using Timer0 in mode 1 and blink all the Pins of P0.
    b) Write and execute a program to create a delay of 50 μsec using Timer1 in mode 0 and blink all the Pins of P2.
    c) Write and execute a program to create a delay of 75msec using counter0 in mode 2 and blink all the Pins of P1.
    d) Write and execute a program to create a delay of 80 μsec using counter1 in mode 1 and blink all the Pins of P3.
11. UART Operation in 8051
    a) Write and execute a program to transfer a character serially with a baud rate of 9600 using UART.
    b) Write and execute a program to transfer a character serially with a baud rate of 4800 using UART.
    c) Write and execute a program to transfer a character serially with a baud rate of 2400 using UART.
12. Interfacing LCD with 8051
    a) Develop and execute the program to interface 16*2 LCD to 8051.
    b) Develop and execute the program to interface LCD to 8051in 4-bit or 8-bit mode.

Reference Books:

1. Kenneth.J.Ayala. The 8051 microcontroller, 3rd edition, Cengage learning,2010.
2. Advanced microprocessors and peripherals-A.K ray and K.M.Bhurchandani, TMH, 2nd edition2006.
3. The 8051 Microcontroller and Embedded Systems: Using Assembly and C by Muhammad AliMazidi, Janice Gillispie Mazidi, Second Edition.

IV Year B.Tech. EEE – I Semester R23 Regulation

	DIGITAL SIGNAL PROCESSING (Professional Elective - IV)	L	T	P	C
		3	0	0	3

UNIT I

Introduction to discrete time signals and systems: Introduction to digital signal processing, Review of discrete-time signals and systems, Analysis of discrete-time linear time invariant systems, frequency domain representation of discrete time signals and systems.

Z–Transform: Definition, ROC, Properties, Poles and Zeros in Z-plane, the inverse Z-Transform, System analysis, Transfer function, BIBO stability, System Response to standard signals, Solution of difference equations with initial conditions, Illustrative Problems, analysis of linear time-invariant systems in the z-domain, pole-zero stability.

UNIT II

Discrete Fourier Transform: Introduction, Discrete Fourier Series, properties of D FS, Discrete Fourier Transform, Inverse DFT, properties of DFT, Linear and Circular convolution, convolution using DFT.

Fast Fourier Transform: Introduction, Fast Fourier Transform, Radix-2 Decimation in time and Decimation in frequency FFT, Inverse FFT (Radix-2).

UNIT III

IIR Filters : Introduction to digital filters, Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital filters from analog filters by Impulse invariant and bilinear transformation methods, Frequency transformations, Basic structures of IIR Filters - Direct form-I, Direct form-II, Cascade form and Parallel form realizations.

UNIT IV

FIR Filters: Introduction, Characteristics of FIR filters with linear phase, Frequency response of linear phase FIR filters, Design of FIR filters using Fourier series and windowing methods (Rectangular, Triangular, Raised Cosine, Hanging, Hamming, Blackman), Comparison of IIR & FIR filters, Basic structures of FIR Filters – Direct form, Cascade form, Linear phase realizations.

UNIT V

Architectures for Programmable DSP Devices: Architecture of TMS320C5X: Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Register ALU, Index Register, Block Move Address Register, Parallel Logic Unit, Memory mapped registers, program controller, some flags in the status registers, On- chip memory, On-chip peripherals.

Textbooks:

1. John G. Proakis, Dimitris G. Manolakis, Digital Signal Processing, Principles, Algorithms, and Applications, Pearson Education, 2007.
2. A.V.Oppenheim and R.W. Schaffer, Discrete Time Signal Processing ,PHI.

References:

1. S.K.Mitra, Digital Signal Processing – A practical approach , 2nd Edition, Pearson Education, New Delhi, 2004.
2. MH Hayes, Digital Signal Processing, Schaum's Outline series, TATA Mc-Graw Hill, 2007.
3. Robert J. Schilling, Sandra L. Harris, Fundamentals of Digital Signal Processing using Matlab, Thomson, 2007.

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc22_ee99/preview,
2. https://nptel.ac.in/courses/108105055

	INTRODUCTION TO QUANTUM TECHNOLOGIES AND APPLICATIONS (Qualitative Treatment)	L	T	P	C
		3	0	0	3

Course Objectives (COBJ):

- Introduce fundamental quantum concepts like superposition and entanglement.
- Understand theoretical structure of qubits and quantum information.
- Explore conceptual challenges in building quantum computers.
- Explain principles of quantum communication and computing.
- Examine real-world applications and the future of quantum technologies.

Course Outcomes (CO):

- Explain core quantum principles in a non-mathematical manner.
- Compare classical and quantum information systems.
- Identify theoretical issues in building quantum computers.
- Discuss quantum communication and computing concepts.
- Recognize applications, industry trends, and career paths in quantum technology.

Unit 1: Introduction to Quantum Theory and Technologies

The transition from classical to quantum physics, Fundamental principles explained conceptually: Superposition, Entanglement, Uncertainty Principle, Wave-particle duality, Classical vs Quantum mechanics – theoretical comparison,Quantum states and measurement: nature of observation,Overview of quantum systems: electrons, photons, atoms,The concept of quantization: discrete energy levels,Why quantum? Strategic, scientific, and technological significance,A snapshot of quantum technologies: Computing, Communication, and Sensing,National and global quantum missions: India's Quantum Mission, EU, USA, China

Unit 2: Theoretical Structure of Quantum Information Systems

What is a qubit? Conceptual understanding using spin and polarization, Comparison: classical bits vs quantum bits, Quantum systems: trapped ions, superconducting circuits, photons (non-engineering view),Quantum coherence and decoherence – intuitive explanation, Theoretical concepts: Hilbert spaces, quantum states, operators – only interpreted in abstract,The role of entanglement and non-locality in systems, Quantum information vs classical information: principles and differences,Philosophical implications: randomness, determinism, and observer role

Unit 3: Building a Quantum Computer – Theoretical Challenges and Requirements

What is required to build a quantum computer (conceptual overview)?,Fragility of quantum systems: decoherence, noise, and control, Conditions for a functional quantum system: Isolation, Error management, Scalability, Stability, Theoretical barriers:

Why maintaining entanglement is difficult,Error correction as a theoretical necessity, Quantum hardware platforms (brief conceptual comparison),Superconducting circuits, Trapped ions, Photonics, Visionvs reality: what's working and what remains elusive,The role of quantum software in managing theoretical complexities

Unit 4: Quantum Communication and Computing – Theoretical Perspective

Quantum vs Classical Information, Basics of Quantum Communication, Quantum Key Distribution (QKD),Role of Entanglement in Communication,The Idea of the Quantum Internet – Secure Global Networking,Introduction to Quantum Computing,Quantum Parallelism (Many States at Once),Classical vs Quantum Gates, Challenges: Decoherence and Error Correction,Real-World Importance and Future Potential

Unit 5: Applications, Use Cases, and the Quantum Future

Real-world application domains: Healthcare (drug discovery),Material science, Logistics and optimization, Quantum sensing and precision timing, Industrial case studies: IBM, Google, Microsoft, PsiQuantum,Ethical, societal, and policy considerations, Challenges to adoption: cost, skills, standardization,Emerging careers in quantum: roles, skillsets, and preparation pathways,Educational and research landscape – India's opportunity in the global quantum race

Textbooks:

1. Michael A. Nielsen, Isaac L. Chuang, *Quantum Computation and Quantum Information*, Cambridge University Press, 10th Anniversary Edition, 2010.
2. Eleanor Rieffel and Wolfgang Polak, *Quantum Computing: A Gentle Introduction*, MIT Press, 2011.
3. Chris Bernhardt, *Quantum Computing for Everyone*, MIT Press, 2019.

Reference Books:

1. David McMahon, *Quantum Computing Explained*, Wiley, 2008.
2. Phillip Kaye, Raymond Laflamme, Michele Mosca, *An Introduction to Quantum Computing*, Oxford University Press, 2007.
3. Scott Aaronson, *Quantum Computing Since Democritus*, Cambridge University Press, 2013.
4. **Alastair I.M. Rae**, *Quantum Physics: A Beginner's Guide*, Oneworld Publications, Revised Edition, 2005.
5. **Eleanor G. Rieffel, Wolfgang H. Polak**, *Quantum Computing: A Gentle Introduction*, MIT Press, 2011.
6. **Leonard Susskind, Art Friedman**, *Quantum Mechanics: The Theoretical Minimum*, Basic Books, 2014.
7. **Bruce Rosenblum, Fred Kuttner**, *Quantum Enigma: Physics Encounters Consciousness*, Oxford University Press, 2nd Edition, 2011.
8. **GiulianoBenenti, GiulioCasati, GiulianoStrini**, *Principles of Quantum Computation and Information, Volume I: Basic Concepts*, World Scientific Publishing, 2004.

9. **K.B. Whaley et al.**, *Quantum Technologies and Industrial Applications: European Roadmap and Strategy Document*, Quantum Flagship, European Commission, 2020.
10. **Department of Science & Technology (DST), Government of India**, *National Mission on Quantum Technologies & Applications – Official Reports and Whitepapers*, MeitY/DST Publications, 2020 onward.

Online Learning Resources:

- IBM Quantum Experience and Qiskit Tutorials
- Coursera – Quantum Mechanics and Quantum Computation by UC Berkeley
- edX – The Quantum Internet and Quantum Computers
- YouTube – Quantum Computing for the Determined by Michael Nielsen
- Qiskit Textbook – IBM Quantum

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

III B.Tech– I semester **L – T – P – C** **2 – 0 – 0 – 1**

TINKERING LAB

The aim of tinkering lab for engineering students is to provide a hands-on learning environment where students can explore, experiment, and innovate by building and testing prototypes. These labs are designed to demonstrate practical skills that complement theoretical knowledge.

These labs bridge the gap between academia and industry, providing students with the practical experience. Some students may also develop entrepreneurial skills, potentially leading to start- ups or innovation-driven careers. Tinkering labs aim to cultivate the next generation of engineers by giving them the tools, space, and mind-set to experiment, innovate, and solve real-world challenges.

List of experiments:

1) Make your own parallel and series circuits using breadboard for any application of your choice.
2) Design and 3D print a Walking Robot
3) Design and 3D Print a Rocket.
4) Temperature & Humidity Monitoring System (DHT11 + LCD)
5) Water Level Detection and Alert System
6) Automatic Plant Watering System
7) Bluetooth-Based Door Lock System
8) Smart Dustbin Using Ultrasonic Sensor
9) Fire Detection and Alarm System
10) RFID-Based Attendance System
11) Voice-Controlled Devices via Google Assistant
12) Heart Rate Monitoring Using Pulse Sensor
13) Soil Moisture-Based Irrigation
14) Smart Helmet for Accident Detection
15) Milk Adulteration Detection System
16) Water Purification via Activated Carbon
17) Solar Dehydrator for Food Drying
18) Temperature-Controlled Chemical Reactor
19) Ethanol Mini-Plant Using Biomass
20) Smart Fluid Flow Control (Solenoid + pH Sensor)
21) Portable Water Quality Tester

22) AI Crop Disease Detection
23) AI-based Smart Irrigation
24) ECG Signal Acquisition and Plotting
25) AI-Powered Traffic Flow Prediction
26) Smart Grid Simulation with Load Monitoring
27) Smart Campus Indoor Navigator
28) Weather Station Prototype
29) Fire fighting Robot with Sensor Guidance
30) Facial Recognition Dustbin
31) Barcode-Based Lab Inventory System
32) Growth Chamber for Plants
33) Biomedical Waste Alert System
34) Soil Classification with AI
35) Smart Railway Gate
36) Smart Bin Locator via GPS and Load Sensors
37) Algae-Based Water Purifier
38) Contactless Attendance via Face Recognition

Note:

1. The students can also design and implement their own ideas, apart from the list of experiments mentioned above.
2. A minimum of 8 to 10 experiments must be completed by the students.

To
DCE

Submitted to the principal:

Sub: Submission of R23 Course structure and syllabus for III year and IV year B.Tech ECE along with Open Elective Courses and their syllabus, Course structure and syllabus for Honors degree in ECE-VLSI specialization and Course structure and syllabus for Minors degree in ECE – reg.

I am herewith submitting the following documents of R23 Regulations of ECE department based on BOS meeting conducted online and approval from the members of BOS of ECE department.

1. Course structure and syllabus for III year and IV year B.Tech ECE
2. Open Elective Courses and their syllabus
3. Course structure and syllabus for Honors degree in ECE-VLSI specialization
4. Course structure and syllabus for Minors degree in ECE
5. Course structure and Syllabus for the service courses offered by ECE department as requested by Head EEE department

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