TECHNO INDIA UNIVERSITY
WEST BENGAL

Department of Electronics and Communication Engineering

Fourth Semester

Program:B.Tech in Electronics and Communication Engineering	**Year, Semester:** 2nd year, 4th Sem
Course Title: CAREER ADVANCEMENT & SKILL DEVELOPMENT	**Subject Code:**TIU-UEN-S298
Contact Hours/Week: 2-0-0 (L-T-P)	**Credit:** 2

COURSE OBJECTIVE:

Enable the student to:

1. Strengthen and expand their communication skills in French.
2. Develop greater fluency in listening, speaking, reading, and writing.
3. Understand and apply more complex grammatical structures and vocabulary.
4. Express ideas in past and future tenses in conversations and written texts.

COURSE OUTCOME:

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

CO-1:	Recognize and use an expanded range of everyday expressions.	K1
CO-2:	Understand and respond to conversations involving personal experiences.	K2
CO-3:	Use the passé composé and imparfait to talk about past events.	K3
CO-4:	Appraise short narratives, dialogues, and informational texts.	K4
CO-5:	Compose personal letters and messages.	K5
CO-6:	Generate and sustain conversations about familiar topics.	K5

COURSE CONTENT:

MODULE 1:	EXPRESSING PAST EVENTS • Introduction to passé composé • Using auxiliary verbs "être" and "avoir" • Talking about past experiences	**6 Hours**
MODULE 2:	DESCRIBING ROUTINES AND HABITS IN THE PAST • Introduction to imparfait • Differences between passé composé and imparfait • Describing past habits and ongoing actions	**6 Hours**
MODULE 3:	FUTURE PLANS AND INTENTIONS • Expressing future intentions with "aller + infinitive" • Talking about upcoming events and travel plans • Making appointments and invitations	**6 Hours**
MODULE 4:	SHOPPING, SERVICES, AND TRANSACTIONS • Asking for help and making purchases • Using expressions of quantity and price • Talking about preferences and needs	**6 Hours**
MODULE 5:	SOCIAL INTERACTIONS AND EVERYDAY SCENARIOS • Making polite requests and giving advice • Expressing opinions and emotions • Writing informal letters and messages	**6 Hours**
TOTAL LECTURES		**30 Hours**

Books:

Tech French - French for Science and Technology, Goyal Publishers, 2011

Program: B. Tech. in ECE	**Year, Semester:** 2nd Yr., 4th Sem.
Course Title: Probability and Statistics	**Subject Code:**TIU-UMA-T202

Contact Hours/Week: 3–0–0 (L–T–P)	**Credit:** 3

COURSE OBJECTIVE:

Enable the student to:

1. understand the basics of probability and statistical analysis
2. analyze the nature of problems solved with probability distribution
3. understand basic statistics, dispersion, regression and curve fitting technique

COURSE OUTCOME:

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

CO-1:	To apply the foundational principles of probability and to have an idea of basic statistical features of data	K4
CO-2:	To derive the probability of events, represent events as random variables and calculate their probabilities	K4
CO-3:	To formulate and analyze several well-known distributions, including Binomial, Poisson, Normal, Exponential Distributions etc., and understand their scope of application to real world problems	K4
CO-4:	To calculate Measures of central tendences and analyze data based on them	K4
CO-5:	To calculate Measures of dispersion – standard deviation, variance	K4
CO-6:	To analyze observations in terms of regression and curve fitting	K4

COURSE CONTENT:

MODULE 1:	**PROBABILITY**	**20 Hours**
Probability: Classical, relative frequency and axiomatic definitions of probability, mutually exclusive events, independent events, conditional probability, Bayes' Theorem. Random Variables: Discrete and continuous random variables, probability mass, probability density and cumulative distribution functions, mathematical expectation, moments. Distributions: Uniform, Binomial, Geometric, Poisson, Negative binomial, Exponential, Normal distributions, Joint and marginal distribution.		
MODULE 2:	**STATISTICS**	**19 Hours**
Graphical representation of data, Frequency distributions, Measures of central tendencies – mean, median, mode, Measures of dispersion – standard deviation, variance, Principle of Least Squares, curve fitting, regression analysis.		
TOTAL LECTURES		**39 Hours**

Books:

1. Ravish R Singh, Mukul Bhatt Engineering Mathematics, McGraw-Hill Education

2. N G Das, Statistical Methods, McGraw-Hill
3. Sheldon M. Ross, Introiduction to Prpbability band Statistics for Engineers and Scientists, McGraw-Hill.

Program: B. Tech. in ECE	**Year, Semester:** 2nd Yr., 4th Sem.
Course Title: Analog Electronic Circuits	**Subject Code:** TIU-UEC-T212
Contact Hours/Week: 3–1–0 (L–T–P)	**Credit:** 4

COURSE OBJECTIVE:

Enable the student to:

COB	Objectives
1.	To develop fundamental idea on the operating principle and the characteristics of diode and transistors.
2.	Different types of applications based on Diode, Bipolar junction transistor and MOSFET can be learnt.
3.	To develop basic concept on simple feedback circuits and feedback-based oscillator design.
4.	To give some knowledge on Operational Amplifier and various types of Operational Amplifier based applications.
5.	To learn about the operating principle of various types of power amplifier circuits and various multivibrators.
6.	To develop new analog electronics circuits using theoretical ideas.

COURSE OUTCOME:

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

COs	Outcomes	Level
1.	Ability to **recognize** operating principlesofdifferent types of analog electronic device.	K2
2.	**Understand** the characteristics of diodes, transistors, MOSFET and also the functioning methods of OP-AMP and OP-AMP based circuits.	K2
3.	Able to **calculate** different parameters of the analog circuits.	K3
4.	**Illustrate** mathematical and graphical representations of all Analog electronic circuits and observe their natures.	K3

5.	**Analyze** various rectifiers, amplifier circuits, oscillator circuits, Power amplifiers, multivibrators, VCO, PLL	K4
6.	**Identifying** the errorsand correcting the faults in the circuit models.	K4

COURSE CONTENT:

MODULE 1:	**Introduction to Electronic circuits:**	**6 Hours**
Diode & their Applications: rectifier circuits (half-wave and full wave rectifiers, rectifiers with capacitor filter), voltage regulator (using Zener diode), voltage multipliers, clipper(amplitude limiter) circuits, clamper circuits.		
MODULE 2:	**Bipolar Junction Transistors and their Applications:**	**8 Hours**
Structure and modes of operation, n-p-n and p-n-p transistor, DC analysis of both transistor circuits, Transistor Biasing and Stability, Q-point, BJT as an amplifier, small signal equivalent circuits, single-stage BJT amplifier, BJT as a switch.		
MODULE 3:	**Metal Oxide Semiconductor Field-Effect Transistors and their Applications:AND PROBABILISTIC MODELS**	**8 Hours**
Structure and physical operation of n-type and p-type MOSFET, MOSFET biasing circuits, MOSFET as an amplifier, small-signal equivalent circuits, single-stage MOSFET amplifier, MOSFET as a switch.		
MODULE 4:	**Feedback Amplifiers & Oscillators:**	**7 Hours**
Feedback concept, negative & positive feedback, voltage/current, series/shunt feedback, Berkhausen criterion, Colpitts, Hartley's, Phase shift, Wein bridge and crystal oscillators.		
MODULE 5:	**Operational Amplifier (Opamp):**	**8 Hours**
Ideal op amp; inverting amplifier, amplifier with a T-network, effect of finite gain, summing amplifier; non-inverting configuration, voltage follower; op-amp applications like current-tovoltage converter, voltage-to-current converter, difference amplifier, instrumentation amplifier, integrator and differentiator, Current mirror circuit, Active Filter Design using Opamp.		
MODULE 6:	**Power amplifiers and wave generators:**	**8 Hours**
Class A, B, AB, C, Conversion efficiency, Tuned amplifier, Multivibrator- Monostable, Bistable, Astable multivibrators using BJT, Monostable and astable operation using 555 timer Special Functional Circuits-VCO and PLLcations.		
TOTAL LECTURES		**45 Hours**

Books:

TEXT BOOKS:

1. R. Boylestad& L. Nashelsky, “Electronic Devices & Circuit Theory”, Pearson
2. P.C. Rakshit & D. Chattopadhyay, “Electronics: Fundamental & Application”, New Age

REFERENCE BOOKS:

1. T. L. Floyd, “Electronic Devices”, Pearson.
2. L. K. Maheshwari, “Analog Circuits”, Laxmi Publications.

Program: B. Tech. in ECE	**Year, Semester:** 2nd Yr., 4th Sem.
Course Title: Digital Electronics and Logic Design	**Subject Code:** TIU-UEC-T214
Contact Hours/Week: 3–1–0 (L–T–P)	**Credit:** 4

COURSE OBJECTIVE:

1. Students will be able to demonstrate a fundamental understanding of number systems, Boolean algebra, and logic operations to simplify digital circuits.
2. Students will be able to design and analyze combinational circuits such as multiplexers, demultiplexers, encoders, decoders, and arithmetic circuits.
3. Students will be able to design and analyze sequential circuits, including flip-flops, registers, and counters, to develop memory and timing applications.
4. Students will be able to apply digital logic design principles in real-world applications, such as programmable logic devices and microprocessor-based systems.

COURSE OUTCOME:

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

CO-1:	Became familiar with the Boolean algebra, logic gates, logical variables, the truth table, number systems, codes and their conversion from to others and also the different logic families involved in the digital system.	K1
CO-2:	Learn the minimization techniques to simply the hardware requirements of digital circuits, implement it, design, and apply for real time digital systems.	K3
CO-3:	Understand the working mechanism and design guidelines of different combinational circuits and their role in the digital system design.	K2
CO-4:	Understand the working mechanism and design guidelines of different modular combinational circuits with MUX/DEMUX, Decoder, Encoder and their role in the digital system design.	K2
CO-5:	Understand the working mechanism and design guidelines of synchronous sequential logic circuits and their role in the digital system design.	K2
CO-6:	Became able to know various types of components like- memory elements, programmable array devices, and use HDL & appropriate EDA tools for digital logic design and simulation.	K4

COURSE CONTENT:

MODULE 1:	**NUMBER SYSTEM AND CODES**	**6 Hours**
Number System and Codes: Decimal, binary, octal and hexadecimal number systems and their arithmetic operations, conversion of one number system to another, Signed and floating point representations of binary numbers, 1's complement and 2's complement representations, Binary codes, natural BCD codes, Excess-3, Gray codes, Alphanumeric codes, code conversion- from one code to another.		
MODULE 2:	**LOGIC GATES, BOOLEAN ALGEBRA & BASIC LOGIC FAMILIES**	**12 Hours**

Logic Gates, Boolean Algebra & Basic logic families: NOT, AND, OR, NAND, NOR, XOR and XNOR –operations, truth tables and Venn diagram representations, universal gates, postulates and laws of Boolean algebra, De Morgan's theorem, minterms and maxterms, SOP and POS forms, Switching algebra, minimizing functions using Kmaps, Minimization using QM method, Different logic families: TTL, ECL.		
MODULE 3:	**COMBINATIONAL AND ARITHMETIC LOGIC CIRCUITS**	**8 Hours**
Combinational and arithmetic logic circuits: Adders/subtractors circuit using logic gates, fast adder, magnitude comparator, multiplexer demultiplexers, encoders, decoders, priority encoders, parity generator and checkers, BCD adder and subtractor.		
MODULE 4:	**SEQUENTIAL LOGIC CIRCUITS**	**8 Hours**
Sequential Logic Circuits: Flip flops and latches, S-R, J-K, D and T type flip-flops and their conversions, master-slave configuration, edge triggered and level triggered clock, registers, shift registers, synchronous and asynchronous counters, ring and Johnson (twisted ring) counters, Modulus Counters.		
MODULE 5:	**MEMORY AND PROGRAMMABLE LOGIC DEVICES**	**6 Hours**
Memory and Programmable Logic Devices: ROM, PROM, RAM-SRAM, DRAM, EPROM, EEPROM, Flash ROM, Programmable and gated array devices for designing combinational circuits PAL, PLA, PLD, CPLD, FPGA with examples.		
MODULE 6:	**FINITE STATE MACHINES**	**6 Hours**
Finite State Machines: Finite state machine state transition diagrams and state transition tables, Moore & Mealy machine state diagram, state variable, state table and state minimization, design of state machines using combinational logic circuits and memories.		
TOTAL LECTURES		**46 Hours****

Books:

4. D. P. Leach and A. Malvino, "Digital Principles and Applications", 7th Edi. McGraw Hill.
5. M. Morris Mano & M. D. Ciletti, "Digital Design", 3rd Edition, Prentice Hall.
6. A. Anand Kumar, "Fundamentals of Digital Circuits", Prentice Hall.
7. S. Salivahanan and S. Arivazhagan, "Digital Circuits & Design", Vikas.
8. D. L. Schilling and H. Taub, "Digital Integrated Electronics", McGraw Hill.
9. J. Bhaskar, "A VHDL Primer", Pearson.

Program: B. Tech. in ECE	**Year, Semester:** 2nd Yr., 4th Sem.
Course Title: Signals and Systems	**Subject Code:** TIU-UEC-T206
Contact Hours/Week: 3–0–0 (L–T–P)	**Credit:** 3

COURSE OBJECTIVE:

Enable the student to:

1. Analyze different types of signals.

2. Represent continuous and discrete systems in time and frequency domain using different transforms.
3. Investigate whether the system is stable.
4. Sampling and reconstruction of a signal.

COURSE OUTCOME:

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

CO-1:	Analyze different types of signals and LTI systems.	K4
CO-2:	Analyze continuous and discrete systems in time and frequency domain using different transforms.	K3, K4
CO-3:	Understand the stability of systems and types of systems.	K1, K2
CO-4:	Understand the knowledge of Sampling and reconstruction of a signal	K2
CO-5:	Understanding the concepts of random process and transformation of independent variable.	K1, K2
CO-6:	Analyzing Z transform and understand the basic idea of system modelling.	K3, K4

COURSE CONTENT:

MODULE 1:	**Types of signals:**	**12 Hours**
Introduction to signals, Periodic & non periodic, analog & digital, deterministic & random, energy & power signals. Fourier analysis: Fourier series representation of periodic signals, Fourier transform & their properties, singularity function, unit impulse, unit step etc. Application of Fourier transform for analysis of LTI networks, the concept of frequency in continuous & discrete time domain, LTI system: Causality, stability, Introduction to Fourier series for discrete time periodic signals, discrete Fourier transform, DFT as a linear transformation, properties of DFT such as convolution, multiplication.		
MODULE 2:	**Time and Frequency characterization:**	**6 Hours**
Magnitude phase representation of Fourier transform, frequency response of LTI systems, time domain properties of ideal frequency selective filters, time domain and frequency domain aspects of non-ideal filters.		
MODULE 3:	**Random variable & process:**	**8 Hours**
Random variable, random process. Correlation function (auto & cross) cumulative distribution function. Probability density function, joint cumulative & distribution and probability density function. System response to random signals: Filtered random process lowpass and bandpass; Basic concept of optimum filtering: Wiener Hopf filter.		
MODULE 4:	**Sampling:**	**6 Hours**
Sampling theorem, reconstruction of signals from samples. Effect of sampling, continuous and discrete time signals, transformation of the independent variable. Continuous and discrete time systems		
MODULE 5:	**Introduction to Z transform:**	**8 Hours**
Region of convergence, properties of z-transform, inverse z-transform using different technique, its application.		

MODULE 6:	System modeling:	6 Hours
Modeling in terms of differential equation, state variables, transfer function(using Laplace Transform); concept of impulse and step response.		
TOTAL LECTURES		**46 Hours**

TEXT BOOKS:

1. S. Haykin and B. Van Veen, “Signals and Systems”, Wiley
2. Rishabh Anand, “Signals and Systems”, Khanna Publishing House.
3. A. Anand Kumar, “Signals and Systems”, Prentice Hall of India.
4. Tarun Rawat, “Signals and Systems”, Oxford University Press.

REFERENCE BOOKS:

1. A. V. Oppenheim, A.S. Willsky and W. H. Nawab, “Signals and Systems”, Prentice Hall.
2. Douglas K. Lindner, "Introduction to Signals and Systems", McGraw Hill International Edition: c1999.
3. 4. E. W. Kamen and B. S. Heck, “Fundamentals of Signals and Systems: Using the Web and Matlab”, Pearson.
4. 7. 8. I. J. Nagrath, S. N. Sharan, R. Ranjan and S. Kumar, “Signals and Systems”, Prentice Hall of India.

Program: B. Tech. in ECE	**Year, Semester:** 2nd Yr., 4TH Sem.
Course Title: Microprocessor & microcontroller	**Subject Code:**TIU-UEC-T210
Contact Hours/Week: 3–0–0 (L–T–P)	**Credit:** 3

COURSE OBJECTIVE:

Enable the student to:

1. Learn about the fundamentals of Microprocessor and Microcontroller Systems and its Components. They should be able to write and understand the assembly language program by applying the concept of 8085 and 8086 microprocessors’ architecture, interrupts, instructions set etc.
2. Understand the working principle, pin diagram, memory interfacing, instructions of 8051 microcontroller so that they can design application specific systems.
3. Analyze the microprocessor-based system they need to understand the operations of different peripheral devices such as 8255, 8257/8237A, 8259,8253 etc. and corresponding interfacing circuits
4. Understand measurement and control techniques of different electrical, physical quantities by designing and analyzingprocessor-based systems.

COURSE OUTCOME:

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

CO-1:	Understand the architecture, addressing modes, instruction set, and interrupts of the 8085 microprocessors.	K2
CO-2:	Understand the architecture, addressing modes, instruction set, and interrupts of the 8086 microprocessors.	K2
CO-3:	Apply assembly language programming skill using the instruction set of the 8085, 8086 to write different types of programs	K3
CO-4:	Illustrate the interfacing of peripheral devices like 8255, 8257, 8259, 8251, 8253, and 8254 with microprocessors for efficient data transfer	K3,k1
CO-5:	Understand the architecture, addressing modes, instruction set, and interrupts of the 8051 microprocontroller.	K2
CO-6:	Identify the role of data acquisition systems, including sample and hold circuits, multiplexers, and A/D and D/A converters, in microprocessor-based applications.	K4

COURSE CONTENT:

MODULE 1:	**MICROPROCESSOR -8085**	**10 Hours**
Evolution of microprocessors and microcontrollers, memory devices, number system, architecture, 8085 Microprocessor: Pin assignments, architecture, addressing modes, interrupts, instruction format, instruction set and assembly language programming Interrupts, instruction set and assembly language programming of 8085 microprocessor.		
MODULE 2:	**MICROPROCESSOR -8086**	**8 Hours**
8086 Microprocessor: Pin assignments, minimum and maximum mode, architecture, addressing modes, interrupts, instruction format, instruction set and assembly language programming, introduction to 8087 math coprocessor.		
MODULE 3:	**PERIPHERAL DEVICES**	**10 Hours**
Peripheral Devices and Their Interfacing: Introduction, memory and I/O interfacing, data transfer schemes, programmable peripheral interface (8255), programmable DMA controller (8257, 8237A), programmable interrupt controller (8259), programmable communication interface (8251), programmable counter/interval timer (8253 and 8254), special purpose interfacing devices, elements and circuits for interfacing.		
MODULE 4:	**8051 MICROCONTROLLER**	**10 Hours**
Architecture, instruction set and assembly language programming of 8051 microcontroller.Data Acquisition System: Sample and Hold (S/H) circuit, multiplexer, signal conditioner, A/D and D/A Converters, multi-channel data acquisition system.		
MODULE 5:	**APPLICATION**	**6 Hours**
Applications: Measurement and control of electrical and physical quantities, case studies		
TOTAL LECTURES		**44 Hours**

TEXT BOOKS:

1. R. Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", Penram.
2. B.Ram, "Fundamentals of Microprocessors and Microcontrollers" ,Dhanpat Rai Publication.

REFERENCE BOOKS:

1. P. K. Ghosh and P. R. Sridhar, "0000 to 8085: Introduction to Microprocessors for Engineers and Scientists", PHI Learning
2. D. V. Hall, "Microprocessors and Interfacing", McGraw Hill
3. K. M. Bhurchandi and A. K. Ray, "Advanced Microprocessors and Peripherals", Tata McGraw Hill
4. M. A. Mazidi, J. G. Mazidi and R. D. McKinlay, "The 8051 Microcontroller and Embedded Systems", Pearson
5. K. Ayala, "The 8051 Microcontroller", Delmar Cengage Learning

Program: B.Tech. in ECE	**Year, Semester:** 2nd, 4th
Course Title: Analog Circuit Laboratory	**Subject Code:** TIU-UEC-L202
Contact Hours/Week: 0–0–3	**Credit:** 1.5

COURSE OBJECTIVE:

Enable the student to:
Understand and analyze different wave-shaping and amplification circuits. The clipper circuits (positive, negative, and biased) help study how diodes modify waveforms by limiting voltage levels. The clamper circuits shift DC levels while maintaining waveform shape. The voltage doubler and tripler circuits demonstrate how capacitors and diodes increase DC voltage without a transformer. The op-amp experiments cover offset null adjustment for precision, non-inverting and inverting amplifiers for signal amplification, unity gain follower for impedance matching, and low-pass filter for frequency selection, all essential in signal processing and communication systems.

COURSE OUTCOME:

On completion of the course, the student will be able:

CO-1	Analyze and implement positive and negative clipper circuits, both biased and unbiased, to understand waveform shaping and clipping effects.	K3
CO-2	Design and experiment with positive and negative clamper circuits to explore voltage level shifting and waveform modification.	K3
CO-3	Construct and analyze voltage doubler and tripler circuits to investigate methods of increasing output voltage in rectifier circuits.	K4
CO-4	Perform OP-AMP offset null adjustment to minimize output offset voltage in operational amplifiers.	K3
CO-5	Design and analyze inverting and non-inverting OP-AMP amplifier circuits to study signal amplification with different configurations.	K4

CO-6	Implement OP-AMP as a unity gain follower and low-pass filter to understand its applications in signal buffering and filtering.	K3

COURSE CONTENT:

MODULE 1:	Positive and Negative Clipper Circuits	**9 Hours**
Design and analysis of positive and negative clipper circuits to limit voltage signals in different regions.		
MODULE 2:	Positive and Negative Biased Clipper Circuits	**9 Hours**
Study of biased clipper circuits for shifting the clipping level by adding bias to the signal.		
MODULE 3:	Positive and Negative Clamper Circuits	**6 Hours**
Construction and analysis of clamper circuits that shift the signal to a new DC level for both positive and negative polarity.		
MODULE 4:	Voltage Doubler and Tripler Circuits	**6 Hours**
Implementation and testing of circuits that double and triple input voltage using diodes and capacitors.		
MODULE 5:	Op-Amp Offset Null Adjustment and Non-Inverting Amplifier	**6 Hours**
Practical adjustment of op-amp offset null and designing a non-inverting amplifier with specific gain.		
MODULE 6:	Op-Amp as Unity Gain Follower and Low-Pass Filter	**9 Hours**
Use of op-amp as a unity gain buffer and designing an op-amp-based low-pass filter for frequency selection.		
TOTAL LAB HOURS		**45 Hours**

Books:

1. "Electronic Devices and Circuit Theory" by Robert L. Boylestad and Louis Chapra,
2. Operational Amplifiers and Linear Integrated Circuits" by Robert F. Coughlin and Frederick F. Driscoll
3. "Microelectronic Circuits" by Adel S. Sedra and Kenneth C. Smith
4. "Design with Operational Amplifiers and Analog Integrated Circuits" by Sergio Franco

Program:B.Tech. in ECE	**Year, Semester:** 2nd, 4th.
Course Title: Digital Electronics Lab	**Subject Code:**TIU-UEC-L204
Contact Hours/Week: 0–0–3	**Credit:** 1.5

COURSE OBJECTIVE:

Enable the student to:

1. Study basic and universal logic gates and verify their truth tables through practical implementation.

2. Design arithmetic circuits, multiplexers, decoders, and code converters.
3. Implement flip-flops and counters to understand memory storage and sequential logic.
4. Gain hands-on experience in troubleshooting and designing digital electronic circuits.

COURSE OUTCOME:

On completion of the course, the student will be able:

CO-1	Understand the fundamental concepts of logic gates and their operations.	K2
CO-2	Implement and Analyze logic circuits using universal gates and verify their truth tables.	K4
CO-3	Analyze and Design combinational circuits and validate their functionalities.	K4
CO-4	Apply the working principles of basic sequential circuits.	K3
CO-5	Design and Develop optimized digital circuits for real-world applications using logic gates and sequential elements.	K6
CO-6	Evaluate the performance of various digital circuits and troubleshoot faults in hardware implementation.	K5

COURSE CONTENT:

MODULE 1:	**BASIC LOGIC GATES**	**9 Hours**
Basic gates (AND, OR, NOT), universal gates (NAND, NOR), and exclusive gates (XOR, XNOR)		
MODULE 2:	**DATA REPRESENTATION & CONVERSION**	**6 Hours**
Even and odd parity generation and checking, Binary to Gray and Gray to Binary Conversion		
MODULE 3:	**ARITHMETIC CIRCUITS**	**9 Hours**
Half Adder, Full Adder, Half Subtractor, and Full Subtractor circuits		
MODULE 4:	**COMBINATIONAL LOGIC CIRCUITS**	**9 Hours**
Multiplexer, decoder		
MODULE 5:	**SEQUENTIAL CIRCUITS - FLIP-FLOPS**	**6 Hours**
Different types of flip-flops (SR, JK, D, and T)		
MODULE 6:	**SEQUENTIAL CIRCUITS - COUNTERS**	**6 Hours**
Asynchronous and synchronous counters		
TOTAL LAB HOURS		**45 Hours**

Books:

1. M. Morris Mano & Michael D. Ciletti – Digital Design (5th Edition) PEARSON.
2. Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss – Digital Systems: Principles and Applications (12th Edition) PEARSON.
3. A. Anand Kumar – Fundamentals of Digital Circuits (4th Edition)PHI.

4. S Salivahanan, S Arivazhagan - Digital Circuits And Design (5th Edition) OXFORD UNIVERSITY PRESS

Program: B.Tech. in ECE	**Year, Semester:** 2nd, 4th.
Course Title: Microprocessor and Microcontroller Lab	**Subject Code:**TIU-UEC-L212
Contact Hours/Week: 0–0–3	**Credit:** 1.5

COURSE OBJECTIVE:

Enable the student to:

4. Learn how to write, execute and debug assemble language programs (ALPs) for microprocessors.
5. Understand data manipulation, arithmetic, bitwise and logical operations for microprocessors.
6. Understand about memory addressing and data storage for microprocessors.
7. Understand the uses of looping, branching and conditional and unconditional jumps in ALPs to control execution flow for microprocessors.
8. Learn the code-conversion to understand data representation techniques for microprocessors.
9. Learn to implement algorithms for array processing such as searching and sorting, and handling multiple data values in memory for microprocessors.

COURSE OUTCOME:

On completion of the course, the student will be able:

CO-1	Understand microprocessor architecture, memory organization, and register operations and assembly language programming.	K2
CO-2	Perform data manipulation and bitwise operations for complement, shifting, masking, and mask-off of data.	K3
CO-3	Implement arithmetic and logical operations to perform addition, subtraction, multiplication and division.	K3
CO-4	Apply data conversion and encoding techniques for efficient data representation.	K3
CO-5	Develop and implement sorting and searching algorithms.	K4
CO-6	Learn how to store and retrieve data from specific memory locations, and debug and optimize assembly language programs for efficient execution.	K4

COURSE CONTENT:

MODULE 1:	**DATA MANIPULATION AND BITWISE OPERATIONS**	**6 Hours**
1’s and 2’s complement of input data, shifting or rotating of accumulator contents.		
MODULE 2:	**ARITHMETIC OPERATIONS**	**9 Hours**

Addition and subtraction of input data using control flow (loop), use of different arithmetic and branch control instructions.		
MODULE 3:	**DATA ENCODING AND MASKING**	**6 Hours**
Pack (mask) and unpack (mask off) of input data, checking even or odd input data, use of logical and branch control instructions.		
MODULE 4:	**DATA CONVERSION**	**9 Hours**
BCD to Binary conversion and vice-versa: use of arithmetic, logical and branch control instructions.		
MODULE 5:	**SORTING AND SEARCHING ALGORITHMS**	**9 Hours**
Searching and sorting of data from an array: handling of multiple memory locations for different data, use of branch control instructions.		
MODULE 6:	**ADVANCED ARITHMETIC OPERATIONS**	**9 Hours**
Multiplication and division of input data using control flow (loop), use of different arithmetic and branch control instructions, repetitive addition and subtraction methods.		
TOTAL LAB HOURS		**48 Hours**

Books:

5. R. Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085",Penram
6. A. NagoorKani,"Microprocessor (8085) And its Applications" 2005, McGraw-Hill Education
7. D. V. Hall, "Microprocessors and Interfacing", McGraw Hill
8. M. A. Mazidi, J. G. Mazidi and R. D. McKinlay, "The 8051 Microcontroller and Embedded Systems", Pearson