

SREENIVASAINSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
(Autonomous)

Minor - ELECTRONIC SYSTEMS - Offered by ECE Department

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	23MRECS1	Electronic Circuits	3	-	-	3	30	70	100
2	23MRECS2	Digital Electronics	3	-	-	3	30	70	100
3	23MRECS3	Principles of Communication Engineering	3	-	-	3	30	70	100
4	23MRECS4	Electronic Instrumentation	3	-	-	3	30	70	100
5	23MRECS5	Microprocessors and Microcontrollers	3	-	-	3	30	70	100
6	23MRECS6	Electronic Circuits and Digital Electronics	-	-	3	1.5	30	70	100
7	23MRECS7	Microprocessors and Microcontrollers Lab	-	-	3	1.5	30	70	100

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ECE Department
ELECTRONIC SYSTEMS

23MRECS1	ELECTRONIC CIRCUITS	L	T	P	C
		3	0	0	3

PRE-REQUISITES:

COURSE EDUCATIONAL OBJECTIVES:

- To understand semiconductor diodes, their characteristics and applications.
- To explore the operation, configurations, and biasing of BJTs.
- To study the operation, analysis, and coupling techniques of BJT amplifiers.
- To learn the operation, applications and uses of feedback amplifiers and oscillators.
- To analyze the characteristics, configurations, and applications of operational amplifiers.

UNIT -1:

(9)

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 -2:

(9)

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 -3:

(9)

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 -4:

(9)

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 -5:

(9)

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.

Total Hours: 45

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COURSE OUTCOMES:

On successful completion of the course- students will be able to		Bloom's Level
C01	Understand semiconductor diodes, their characteristics and applications.	
C02	Explore the operation, configurations, and biasing of BJTs.	
C03	Gain knowledge about the operation, analysis, and coupling techniques of BJT amplifiers.	
C04	Learn the operation, applications and uses of feedback amplifiers and oscillators.	
C05	Analyze the characteristics, configurations, and applications of operational amplifiers.	

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, David A. Bell, 5th Edition, Oxford University press. 2008.

REFERENCE BOOKS:

1. Electronics Devices and Circuits Theory, R.L.Boylestad, LouisNashelsky 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.

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23MRECS2	Digital Electronics	L	T	P	C
		3	0	0	3

PRE-REQUISITES:

COURSE EDUCATIONAL OBJECTIVES:

1. To Learn Boolean algebra, logic simplification techniques, and combinational circuit design.
2. To analyze combinational circuits like adders, subtractors, and code converters.
3. To explore combinational logic circuits and their applications in digital design.
4. To understand sequential logic circuits, including latches, flip-flops, counters, and shift registers.
5. To gain knowledge about programmable logic devices and digital IC's.

Unit I: Logic Simplification and Combinational Logic Design (9)

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: (9)

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: (9)

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: (9)

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).

Total Hours: 45

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COURSE OUTCOMES:

On successful completion of the course- students will be able to		Bloom's Level
C01	Learn Boolean algebra, logic simplification techniques, and combinational circuit design.	
C02	Analyze combinational circuits like adders, subtractors, and code converters.	
C03	Explore combinational logic circuits and their applications in digital design.	
C04	Understand sequential logic circuits, including latches, flip-flops, counters, and shift registers.	
C05	Gain knowledge about programmable logic devices and digital IC's.	

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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23MRDSA3	PRINCIPLES OF COMMUNICATION ENGINEERING	L	T	P	C
		3	0	0	3

PRE-REQUISITES:

COURSE EDUCATIONAL OBJECTIVES:

1. To understand the fundamentals of communication systems and amplitude modulation techniques.
2. To learn about the angle modulation techniques and bandwidth considerations in communication systems.
3. To gain knowledge on pulse analog modulation and multiple access techniques used in digital communication systems.
4. To examine pulse modulation and digital modulation techniques used in modern communication systems.
5. To study wireless communication systems, cellular networks, and GSM technology.

Unit I: Analog communication-I:

(9)

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 :

(9)

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):

(9)

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):

(9)

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):

(9)

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.

Total Hours: 45

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COURSE OUTCOMES:

On successful completion of the course- students will be able to		Bloom's Level
CO1	Understand the fundamentals of communication systems and amplitude modulation techniques.	
CO2	Learn about the angle modulation techniques and bandwidth considerations in communication systems.	
CO3	Gain knowledge on pulse analog modulation and multiple access techniques used in digital communication systems.	
CO4	Get familiar with pulse modulation and digital modulation techniques used in modern communication systems.	
CO5	Know about wireless communication systems, cellular networks, and GSM technology.	

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. Rapoport, "Wireless Communications", Pearson Education, 2nd Edition, 2002.

REFERENCE WEBSITE:

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23MRECS4	ELECTRONIC INSTRUMENTATION	L	T	P	C
		3	0	0	3

PRE-REQUISITES:

COURSE EDUCATIONAL OBJECTIVES:

1. To study the working principle, operation, and applications of analog and digital measuring instruments.
2. To explore the working principles, construction, and applications of oscilloscopes in signal analysis.
3. To learn about the bridge circuits for measurement of resistance, inductance, and capacitance.
4. To understand the principles and operation of various signal generators used in electronic applications.
5. To gain knowledge about the operation and applications of transducers in measurement systems.

UNIT I:

(9)

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:

(9)

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:

(9)

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 - Schering Bridge, Wien Bridge, Errors and precautions in using bridges.

UNIT IV:

(9)

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:

(9)

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

Total Hours: 45

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COURSE OUTCOMES:

On successful completion of the course- students will be able to		Bloom's Level
CO1	Know the working principle, operation, and applications of analog and digital measuring instruments.	
CO2	Get familiar with the working principles, construction, and applications of oscilloscopes in signal analysis	
CO3	Learn about the bridge circuits for measurement of resistance, inductance, and capacitance.	
CO4	Understand the principles and operation of various signal generators used in electronic applications	
CO5	Gain knowledge about the operation and applications of transducers in measurement systems.	

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. David A. Bell, "Electronic Instrumentation & Measurements", PHI, 2nd Edition, 2006.

SREENIVASAINSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
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23MRECS5	MICROPROCESSORS AND MICROCONTROLLERS	L	T	P	C
		3	0	0	3

PRE-REQUISITES:

COURSE EDUCATIONAL OBJECTIVES:

1. To comprehend the architecture, operation, and configurations of the 8086 microprocessors.
2. To get familiar with 8086 programming concepts, instruction set, and assembly language development tools.
3. To study the interfacing of 8086 with memory, peripherals, and controllers for various applications.
4. To learn the architecture, instruction set, and programming of the 8051 microcontrollers.
5. To understand microcontroller interfacing techniques, peripheral programming, and processor comparisons.

UNIT -1:

(9)

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 -2:

(9)

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

UNIT -3:

(9)

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 -4:

(9)

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

UNIT -5: Advanced Topics and Hybrid Systems

(9)

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

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Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course- students will be able to		Bloom's Level
C01	Gain knowledge on the architecture, operation, and configurations of the 8086 microprocessors.	
C02	Get familiar with 8086 programming concepts, instruction set, and assembly language development tools	
C03	Know the interfacing of 8086 with memory, peripherals, and controllers for various applications.	
C04	Learn the architecture, instruction set, and programming of the 8051 microcontrollers.	
C05	Understand microcontroller interfacing techniques, peripheral programming, and processor comparisons.	

TEXT BOOKS:

1. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rd Edition, 1994.
2. K M Bhurchandi, A K 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.

REFERENCE BOOKS:

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

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23MRECS6	ELECTRONIC CIRCUITS AND DIGITAL ELECTRONICS LAB	L	T	P	C
		-	-	3	1.5

PRE-REQUISITES: Nil.

COURSE EDUCATIONAL OBJECTIVES:

1. To study the characteristics and applications of semiconductor diodes and transistors.
2. To design and analyze rectifiers, amplifiers, and oscillator circuits.
3. To implement basic Op-Amp applications.
4. To develop the ability to design and implement combinational and sequential logic circuits.
5. To utilize universal gates for logic circuit realization and clock generation.
6. To design and implement essential digital components like adders, multiplexers, flip-flops, encoders, and decoders.

Experiments:

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. 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.

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Course Outcomes:

1. Interpret the characteristics of diodes and transistors for circuit design.
2. Construct and evaluate rectifiers, amplifiers, and oscillator circuits.
3. Implement basic Op-Amp applications.
4. Construct and implement combinational and sequential circuits using logic gates.
5. Design digital systems using universal gates, multiplexers, and comparators.
6. Develop and realize fundamental digital components such as adders, converters, flip-flops, encoders, and decoders.

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23MRECS7	MICROPROCESSORS AND MICROCONTROLLERS LAB	L	T	P	C
		-	-	3	1.5

PRE-REQUISITES: Nil.

COURSE EDUCATIONAL OBJECTIVES:

1. To become skilled in 8086 Assembly Language programming.
2. To understand the detailed software and hardware structure of the microprocessor.
3. Train their practical knowledge through laboratory experiments.
4. To understand and learn 8051 Microcontroller.
5. To acquire knowledge on microprocessors and microcontrollers, interfacing various peripherals, and configuring.

Experiments:

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

1. **Programs for 16 Bit Arithmetic Operations** (Using various addressing modes)
 - a) Write an ALP to Perform Addition and Subtraction of Multi precision numbers.
 - 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 INT 21H 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.

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- 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 using 8251.

9. Programs using Arithmetic and Logical Instructions for 8051

- a) Write an ALP to 8051 Microcontroller to perform Arithmetic operations like addition, subtraction,
- b) Multiplication and Division.
- c) Write an ALP to 8051 Microcontroller to perform Logical operations like AND, OR and XOR.
- d) Programs related to Register Banks.

10. Programs to Verify Timers/Counters of 8051

- 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 interface 16*2 LCD to 8051.
- b) Develop and execute the program to interface LCD to 8051 in 4-bit or 8-bit mode.

Course Outcomes:

1. Formulate a program and implement algorithms using Assembly language.
2. Describe an Assembly language program for the 8086 Microprocessor.
3. Develop programs for different applications in the 8086 Microprocessor.
4. Interface peripheral devices with 8086 and 8051.
5. Use an Assembly/Embedded C programming approach for solving real-world problems.

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 edition 2006.
3. The 8051 Microcontroller and Embedded Systems: Using Assembly and C by Muhammad Ali Mazidi, Janice Gillispie Mazidi, Second Edition.