SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA :: VIJAYAWADA-10
(An autonomous college in jurisdiction of Krishna University, Machilipatnam)

DEPARTMENT OF ELECTTRONICS

Course Code				**23ELMAL231**			
Title of the Course				**Digital Electronics**			
Offered to: (Programme/s)				**B.Sc.(H)-ELE**			
L	**4**	**T**	**0**	**P**	**0**	**C**	**3**
Year of Introduction:	**2024-25**			**Semester:3**			**3**
Course Category:	**Major**			**Course Relates to:**	**Global**		
Year of Revision:	**N/A**			**Percentage:**	**N/A**		
Type of the Course:				**Employability**			
Crosscutting Issues of the Course :				Professional Ethics			
Pre-requisites, if any				**Basic Electronics**			

Course Description:

This course provides a comprehensive introduction to the principles and applications of digital electronics. It covers the fundamental concepts and techniques used in the design and analysis of digital systems. Students will explore binary systems, Boolean algebra, logic gates, combinational and sequential logic circuits, and digital integrated circuits. Emphasis is placed on both theoretical understanding and practical skills, with hands-on lab sessions to reinforce concepts.

Course Aims and Objectives:

S.NO	COURSE OBJECTIVES
1	Understand the basic concepts of digital electronics and its importance in modern technology.
2	Learn to design and analyse combinational and sequential logic circuits.
3	Gain proficiency in using Boolean algebra for simplifying and implementing digital circuits.
4	Develop skills in using digital simulation tools for circuit design and troubleshooting.
5	Understand the operation and application of digital integrated circuits.

Course Outcomes

CO NO	COURSE OUTCOME	BTL	PO	PSO
CO1	Remember the binary number theory of digital circuits	K1	1	1
CO2	Design combinational systems using standard gates and minimization methods (such as karnaugh maps).	K4	5	2
CO3	Apply design various logical inputs of different IC- logic families	K3	6	1
CO4	Design flip-flops and latches for sequential systems composed of standard sequential modules, such as counters and registers	K4	4	2
CO5	Analyse combinational systems composed of standard combinational modules, such as multiplexers and decoders .	K4	3	1

At the end of the course, the student will be able to…

For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

CO-PO MATRIX									
CO NO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	2							2	
CO2					3				3
CO3						3		2	

CO4				**2**					**1**
CO5			**2**					**3**	

Use the codes 3, 2, 1 for High, Moderate and Low correlation Between CO-PO-PSO respectively.

Course Structure:

Unit – 1 : NUMBER SYSTEM AND CODES (12Hrs)

Decimal, Binary, Hexadecimal, Octal , Code Conversions, Complements (1's,2's, 9's and10's), Addition, Subtraction, Grey, Excess-3, inter Code conversion between number system.

Examples/Applications/Case Studies:

- A 4-bit binary number can represent values from 0 to 15, which can be used to control digital switches or memory locations.
- The decimal number 27 is represented in BCD as 0010 0111 (where 0010 is 2 and 0111 is 7).

Exercises/Projects:

- Perform 1's and 2's compliment for this number 1100
- Convert the number 1101 in to gray code.

Specific Resources: (web)

URL: https://byjus.com/maths/number-system/

Unit – 2 : BOOLEAN ALGEBRA AND THEOREMS (12Hrs)

Boolean Theorems, De Morgan's laws. Digital logic gates, Multilevel NAND & NORgates. Standard representation of logic functions (SOP and POS), Minimization Techniques (Karnaugh Map Method: 4 variables), don't care condition.

Examples/Applications/Case Studies:

- Simplifying Boolean Expressions $A \cdot (A+B)$.
- Simplifying Complex Expressions $A \cdot \bar{A} + B \cdot \bar{B} A$

Exercises/Projects:

- simplify the Boolean expression using Demorgan laws
- simplify 4-variable using k-map method $\sum=(0,2,4,6.11.12.13)$

Specific Resources: (web)

URL: https://www.geeksforgeeks.org/boolean-algebraic-theorems/

Unit – 3 : IC LOGIC FAMILIES: (12Hrs)

Digital Logic Families: Characteristics of logic families – fan in, fan out, power dissipation, propagation delay, noise margin., RTL, DTL, RTL, TTL and CMOS logic circuits- Inverter, NAND , NOR

Examples/Applications/Case Studies:

- TRANSISTOR TRANSISTOR LOGIC FAMILY.
- CMOS LOGIC

Exercises/Projects:

- Identify Logic Family Characteristics
- Determine the Logic Family Based on IC Numbers
- **Specific Resources: (web)**

URL: https://evelta.com/categories/integrated-circuits-ics/logic-ics/?page=2

Unit – 4: COMBINATIONAL DIGITAL CIRCUITS (12Hrs)

Adders: Half & full adder, Subtractor – Half and Full Subtractor, Parallel binary adder, Magnitude Comparator, Multiplexers (2:1, 4:1)) and De-multiplexers (1:2, 4:1), Encoder (8-line-to-3-line) and Decoder (3-line-to-8-line).

Examples/Applications/Case Studies:

- Design 8:1 multiplexer
- Design 4:16 Decoder

Exercises/Projects:

- Design Half adder
- Design full adder using two half adders.

Specific Resources: (web)

URL: https://circuitverse.org/

Unit – 5 : SEQUENTIAL DIGITAL CIRCUITS (12Hrs)

Flip -Flops: S-RFF,J-KFF,T and D type FFs, Excitation tables. Registers: shift left register, shift right register, Counters:-Asynchronous-Mod16, Mod-8 Down counter. Synchronous- 4-bit Ring counter

Examples/Applications/Case Studies:

- Count Occurrences of events or pulses.
- Measure the frequency of signals.

Exercises/Projects:

- Design a shift left register using D-flip-flop
- Design a down counter using j-k flip-flop.

Specific Resources: (web)

URL: https://www.javatpoint.com/sequential-circuits-in-digital-electronics

TEXT BOOKS:

1. W.H. Gothmann, 2000, "Digital Electronics - An Introduction, Theory and Practice", 2nd Edition Prentice Hall of India..
2. M.MorrisMano, 2003, "DigitalDesign",4thEdition, Pearson Education (Singapore) Pvt. Ltd. New Delhi.

REFERENCES:

1. A.AnandKumar, (2003) *"Switching Theory and LogicDesign"*–(2ndEdition),PHI.
2. HeiserMan, (2002) *"Handbook of Digital IC applications"*(2nd Edition) , PrenticeHall..
3. T.L. Floyd & Jain,(2010) *"Digital Fundamentals",*(10 Edition), Pearson.

SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA :: VIJAYAWADA-10

(An autonomous college in jurisdiction of Krishna University, Machilipatnam)

Course Code				**23ELMAP231**			
Title of the Course				**Digital Electronics Lab**			
Offered to: (Programme/s)				B.Sc. Hons			
L	**0**	**T**	**0**	**P**	**2**	**C**	**1**
Year of Introduction:	**2024-25**			**Semester:**			**3**
Course Category:	Major			**Course Relates to:**	Global		
Year of Revision:	**N/A**			**Percentage:**	**N/A**		
Type of the Course:				Skill development			
Crosscutting Issues of the Course :							
Pre-requisites, if any				**Basic knowledge on Basic Electronics.**			

Course Description:

In this lab, we explored fundamental concepts of digital electronics, focusing on logic gates, combinational and sequential circuits. We constructed and tested basic gates (AND, OR, NOT, NAND, NOR, XOR) using integrated circuits. Additionally, we built a 4-bit binary adder to demonstrate combinational logic and a D flip-flop to illustrate sequential logic. Measurements were taken with an oscilloscope to verify the timing and functionality of each circuit. The lab emphasized the importance of accurate wiring and timing analysis. Through these experiments, we gained practical insights into designing and troubleshooting digital systems, which are crucial for modern electronics and computing applications.

Course Aims and Objectives:

S.NO	COURSE OBJECTIVES
1	Understand the operation and application of basic logic gates (AND, OR, NOT, NAND, NOR, XOR).
2	Design and implement combinational circuits such as adders, multiplexers, and decoders
3	Construct and analyze sequential circuits like flip-flops, counters, and registers.
4	Develop skills in reading and creating digital circuit schematics.
5	Apply digital logic principles in practical problem-solving scenarios.

Course Outcomes

At the end of the course, the student will be able to…

CO NO	COURSE OUTCOME	BTL	PO	PSO
CO1	Understand and describe the functions of basic logic gates (AND, OR, NOT, NAND, NOR, XOR)	**K2**	**5**	**1**
CO2	Create and analyze combinational circuits such as adders, multiplexers, and decoders,	**K4**	**6**	**1**
CO3	Build and test sequential circuits like flip-flops, counters, and registers, and understand their role in digital systems.	**K5**	**6**	**2**
CO4	Develop the ability to interpret and produce accurate digital circuit diagrams.	**K5**	**7**	**2**
CO5	Enhance skills in identifying and resolving issues in digital circuits through systematic testing and analysis.	**K5**	**5**	**2**

For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create.

CO-PO MATRIX									
CO NO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1					3			3	1
CO2						3		2	1
CO3						2		1	1
CO4							3	2	1
CO5					3			1	1

Use the codes 3,2,1 for High, Moderate and Low correlation Between CO-PO-PSO respectively

This lab list covers the key areas of a Digital Electronics lab course, providing hands-on practice with using Bread board and digital IC's and multi meter.

Unit- 1:

Experiment 1: Boolean Theorems and De Morgan's Laws

- **Objective:** Understand and verify Boolean theorems and De Morgan's laws.
- **Theory:** Discuss fundamental Boolean theorems and De Morgan's laws for simplification of Boolean expressions.
- **Procedure:**
    1. Simplify given Boolean expressions using Boolean theorems.
    2. Verify the simplified expressions by constructing corresponding logic circuits.
    3. Apply De Morgan's laws to given Boolean expressions and simplify.
    4. Construct and test circuits to verify De Morgan's laws.
- **Report:** Document given expressions, simplification steps, circuit diagrams, and test results.

Experiment 2: Digital Logic Gates

- **Objective:** Understand the function of basic digital logic gates.
- **Theory:** Introduction to AND, OR, NOT, NAND, NOR, XOR, and XNOR gates.
- **Procedure:**
    1. Construct basic logic gates using ICs or discrete components.
    2. Verify their truth tables by applying all possible input combinations.
- **Report:** Include circuit diagrams, truth tables, and observations.

Experiment 3: Multilevel NAND and NOR Gates

- **Objective:** Design and implement multilevel NAND and NOR gate circuits.
- **Theory:** Explain how any Boolean function can be implemented using only NAND or NOR gates.
- **Procedure:**
    1. Design given Boolean expressions using only NAND gates.
    2. Design the same expressions using only NOR gates.
    3. Construct the circuits and verify their functionality.
- **Report:** Provide Boolean expressions, circuit diagrams, and test results for both NAND and NOR implementations.

Unit 2:

Experiment 4: Half Adder

Objective: Understand the basic operation of a half adder.

- **Components:** XOR gate, AND gate.
- **Circuit Design:** Construct a half adder circuit.
- **Testing:** Verify the output for different combinations of input values (A, B).
- **Measurements:** Measure output for sum and carry.

Activity: Build the half adder circuit and test its functionality.

Experiment 5: Full Adder

Objective: Learn about the full adder which includes carry-in functionality.

- **Components:** Two XOR gates, two AND gates, one OR gate.
- **Circuit Design:** Construct a full adder circuit.
- **Testing:** Verify the output for all possible input combinations (A, B, Cin).
- **Measurements:** Measure the sum and carry outputs.

Activity: Build the full adder circuit and test it with different inputs.

Experiment 6:. Half Subtractor

Objective: Understand the operation of a half subtractor.

- **Components:** XOR gate, AND gate, NOT gate.
- **Circuit Design:** Construct a half subtractor circuit.
- **Testing:** Verify the output for different combinations of input values (A, B).
- **Measurements:** Measure output for difference and borrow.

Activity: Build the half subtractor circuit and analyze its performance.

Experiment 7: Full Subtractor

Objective: Learn about the full subtractor, which includes borrow-in functionality.

- **Components:** Two XOR gates, two AND gates, two OR gates, one NOT gate.
- **Circuit Design:** Construct a full subtractor circuit.
- **Testing:** Verify the output for all possible input combinations (A, B, Bin).
- **Measurements:** Measure the difference and borrow outputs.

Activity: Build the full subtractor circuit and test it.

Experiment 8: Magnitude Comparator

Objective: Compare two binary numbers and determine their magnitude relationship.

- **Components:** Combination of logic gates.
- **Circuit Design:** Construct a 4-bit magnitude comparator.
- **Testing:** Verify the comparator's output for different 4-bit input pairs.
- **Measurements:** Measure the outputs for equality, greater than, and less than conditions.

Activity: Build a 4-bit magnitude comparator and analyze its functionality.

Unit 3:

Experiment 9: S-R Flip-Flop (Set-Reset)

Objective: Understand the basic operation and characteristics of the S-R flip-flop.

- **Components:** NAND or NOR gates.
- **Circuit Design:** Construct an S-R flip-flop using NAND or NOR gates.
- **Testing:** Verify the operation for different combinations of Set (S) and Reset (R) inputs.
- **Measurements:** Measure setup time, hold time, and propagation delay.

Activity: Build and test an S-R flip-flop. Record the truth table and timing diagrams.

Experiment 10: J-K Flip-Flop

Objective: Learn about the J-K flip-flop and its toggling behavior.

- **Components:** Logic gates or JK flip-flop IC (e.g., 7476).
- **Circuit Design:** Construct a J-K flip-flop.
- **Testing:** Verify the operation for different combinations of J, K, and clock inputs.
- **Measurements:** Measure setup time, hold time, and propagation delay.

Activity: Build and test a J-K flip-flop. Analyze how the flip-flop toggles on different input conditions.

Experiment 11: D Flip-Flop (Data or Delay)

Objective: Understand the operation of the D flip-flop.

- **Components:** D flip-flop IC (e.g., 7474) or constructed using logic gates.
- **Circuit Design:** Construct a D flip-flop.
- **Testing:** Verify the operation for different Data (D) and clock inputs.
- **Measurements:** Measure setup time, hold time, and propagation delay.

Activity: Build and test a D flip-flop. Record how data is latched on the clock edge.

Lab Manual:

Supplied by the Department

References:

1. [Reference 1 - Author(s), Year of Publication, Title, Edition, Publisher]
2. [Reference 2 - Author(s), Year of Publication, Title, Edition, Publisher]

SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA :: VIJAYAWADA-10

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Model Question Paper

TITLE: DIGITAL ELECTRONICS

Course Code: 23ELMIL121 **Maximum Marks: 70M**

Time: 3 Hours **Pass Minimum: 28M**

SECTION – A

Answer any FIVE of the following: **5 x 4 = 20 M**

1. (a)Write about Excess-3 code with example **k1**

(or)

(b)Convert the following decimal number (245) in to binary. **K1**

2. (a)Explain about universal gates **k2**

(or)

(b)Explain about multilevel NAND gate **.k2**

3. (a) Write about the characteristics of logic families. **K3**

(or)

(b) Explain about ECL logic family**.k3**

4. (a) Discuss about magnitude comparator in brief. **K2**

(or)

(b)Explain about decoder and encoder with one example each. **K2**

5. a)Explain the construction and working of D-Flip-flop.**k3**

(or)

b)Discuss about Shift registers in brief. **K3**

Section – B

Answer the following: **5 x 10 = 50 M**

9.(a)Explain about rules of 1's compliment and 2's compliment method.k2

(or)

(b) Convert the following grey code to binary vice-versa.k2

(1)11101 (2)100110—(**co1)-(L2)**

10. (a)Explain briefly about canonical and standard form of Boolean algebra.**k2**

(or)

(b)Simplify the following functions in sum of products using K-map and draw their implementation.

(i)F (A, B, C, D) =∑ (7, 13, 14, 15)

(ii)F(w,x,y,z)=∑(1,3,7,11,15)+d∑(0,2,5) **k2**

11. (a) Discuss briefly about CMOS NOR gate with their truth tables. **K3**

(or)

(b)Discuss about the construction and working of TTL NAND gate and Characteristics.k3

12. a)Explain the construction and working of HALF adder and FULL adder with their logic circuits. **K2** **(or)**

b)Explain the construction and working of HALF sub tractor and FULL sub tractor with their logic circuits. **K2**

13.(a) Explain the operation of JK-Flip-flop and draw the timing diagram.k3

(or)

(b) Define counter and Explain briefly about ripple counter.k3

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SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA :: VIJAYAWADA-10
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Course Code				**23IOMIL231**			
Title of the Course				**Introduction to arm micro controller**			
Offered to: (Programme/s)				B.Sc. AI (Hons), BCA			
L	**4**	**T**	**0**	**P**	**0**	**C**	**3**
Year of Introduction:		**2024-25**		**Semester:**			**3**
Course Category:	**MINOR**			**Course Relates to:**	**GLOBAL**		
Year of Revision:	**N/A**			**Percentage:**	**N/A**		
Type of the Course:				**EMPLOYBILITY**			
Crosscutting Issues of the Course :				**PROFESSIONAL ETHICS**			
Pre-requisites, if any				Basic knowledge of digital logic, computer architecture, and programming is recommended			

Course Description:

This course provides an in-depth exploration of microprocessors and ARM architecture, focusing on the design, operation, and application of microprocessors and ARM-based systems. Students will gain a comprehensive understanding of microprocessor fundamentals, the ARM instruction set architecture, and the practical aspects of designing and programming ARM-based systems. The course covers both theoretical concepts and practical applications, preparing students for roles in embedded systems, system-on-chip (SoC) design, and advanced computing technologies.

Course Aims and Objectives:

S.NO	COURSE OBJECTIVES
1	Understand the fundamental principles of microprocessors and their operation.
2	Learn to design and implement microprocessor-based systems and embedded applications.
3	Gain expertise in ARM architecture, including instruction sets, data processing, and control flow.
4	Develop proficiency in programming and debugging ARM processors.
5	Explore advanced topics such as real-time operating systems (RTOS), system-on-chip (SoC) integration, and low-level hardware interactions.

Course Outcomes

At the end of the course, the student will be able to…

CO NO	COURSE OUTCOME	BTL	PO	PSO
CO1	To remember knowledge on microprocessors 8086 architectures and implement in practical application	**K1**	**3**	**1**
CO2	To understand and device techniques for faster execution of instruct improve the speed of operation and enhance performance of microproces	**K2**	**4**	**2**
CO3	To apply various assembly language programs and test using moderate complexity.	**K3**	**5**	**1**
CO4	To analyze the memory chips and peripheral chips for 16-bit 8086 microprocessor	**K4**	**6**	**1**
CO5	To evaluate multi core processor and its advantages of ARMTDMIS.	**K5**	**5**	**1**

For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

CO-PO MATRIX									
CO NO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1			3					2	
CO2				2					2
CO3					3			2	
CO4						3			2
CO5					3			3	

Use the codes 3, 2, 1 for High, Moderate and Low correlation Between CO-PO-PSO respectively

Course Structure:

Unit – 1 : 8085 ARCHITECTURE (12Hrs)

Introduction, difference between 8085 and 8086, Evaluation of Microprocessor, INTEL - 8085Architecture, CPU, ALU unit, Register organization, Address, data and control Buses. Pin configuration of 8085

Examples/Applications/Case Studies:

- Implement a loop to decrement a counter and store the result
- Basic Addition Operation

Exercises/Projects:

- Calculate the sum of the first 10 natural numbers and store the result in a specified memory location.
- Subtract two 8-bit numbers and check if the result is negative. If negative, set a flag

Specific Resources: (web)

- **Link:** Geeks for Geeks 8085 Architecture
  - https://polynoteshub.co.in/architecture-of-8085/

Unit – 2 : 8086 ARCHITECTURE (12Hrs)

8086 Architecture: Architecture, Internal operation, Pin description of 8086. Instruction format, Machine language instructions, addressing modes

Examples/Applications/Case Studies:

- Add two 16-bit numbers and store the result in a memory location.
- Implement a loop that decrements a counter and accumulates a result.

Exercises/Projects:

- Factorial Calculation
- String Length Calculation.

Specific Resources: (web)

- **Link:** Tutorials Point 8086 Microprocessor
  - https://archive.org/details/8086microprocess00trie

Unit – 3 : INSTRUCTION SET (12Hrs)

INSTRUCTION SET: Data transfer, Logical, Arithmetic, Branch, Flag Manipulation, Shift and rotate Instruction, Loop Instruction, ALP Programmes -ADD, SUB, MUL, DIV, LARGEST ,SMALLEST

Examples/Applications/Case Studies:

- Array Sum Calculation
- String Comparison

Exercises/Projects:

- Multiply and Store Results
- String Manipulation

Specific Resources: (web)

- https://stackoverflow.com/questions/72581111/8086-instruction-set-modr-m-byte

Unit – 4 : ARM PROCESSOR (12Hrs)

Overview of ARM architecture and ARM Cortex-M series, Pipe line process, ARM processor modes and states ARM Cortex-M microcontroller features and benefits, ARM development tools and environment

Examples/Applications/Case Studies:

- Simple Addition
- Loop with Counter

Exercises/Projects:

- Sum of an Array
- Development tools

Specific Resources: (web)

- **Link:** ARM Architecture Reference Manual

https://www.redhat.com/en/topics/linux/what-is-arm-processor

Unit – 5 : INTERFACING (12Hrs)

ARM Cortex-M core architecture, Registers, and instruction sets , Interfacing Digital Input and Output: Interfacing LEDs and Switches – Interfacing Keypads – Interfacing Seven Segment Display – Interfacing LCD .

Examples/Applications/Case Studies:

- Temperature monitoring system
- Home automation

Exercises/Projects:

- Interfacing with a UART (Universal Asynchronous Receiver/Transmitter)
- Interfacing with an ADC (Analog-to-Digital Converter.

Specific Resources: (web)

https://www.keil.com/

Text Books:

1. Ramesh S. Goankar "8085 Microprocessors Architecture Application and Programming, 5th Edition , Penram International.
2. Steve Furber 2012 -ARM System-on-chip Architecture, 2E , Pearson Education.

References:

1. Andrew N. SLOSS , 2016 , ARM System Developer's guide –, 3rd edition ELSEVIER Publications,.
2. William Hohl , 2004,ARM Assembly Language –, 4th edition, CRC Press,
3. Douglas V Hall and SSSP Rao, 2017,MICROPROCESSORS AND INTERFACING - SIE, 3RD EDN Paperback .

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SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA :: VIJAYAWADA-10
(An autonomous college in jurisdiction of Krishna University, Machilipatnam)

Course Code				**23IOMIP231**			
Title of the Course				**Microprocessor lab**			
Offered to: (Programme/s)				B.Sc. Hons			
L	**0**	**T**	**0**	**P**	**2**	**C**	**1**
Year of Introduction:	**2024-25**			**Semester:**			**3**
Course Category:	Minor			**Course Relates to:**	Global		
Year of Revision:				**Percentage:**			
Type of the Course:				Skill development			
Crosscutting Issues of the Course :							
Pre-requisites, if any				Familiarity with basic electronic components			

Course Description:
The Microprocessor Lab provides hands-on experience with microprocessor-based systems. Students will learn to program and interface microprocessors using assembly language and high-level languages. Key activities include writing, debugging, and executing programs to control peripheral devices and implement various functionalities. The lab covers topics such as memory organization, input/output interfacing, and interrupt handling. Utilizing development boards and simulation software, students will design and test microprocessor applications. This lab aims to develop skills in embedded system design, fostering an understanding of microprocessor architecture and its applications in automation, robotics, and real-time systems.

Course Aims and Objectives:

S.NO	COURSE OBJECTIVES
1	Understand the fundamental architecture and operation of microprocessors.).
2	Write, debug, and execute assembly language and high-level language programs for microprocessor-based systems.
3	Utilize development boards and simulation software to test and validate microprocessor designs.
4	Develop problem-solving skills related to embedded systems and microprocessor applications.
5	Design and implement microprocessor-based applications, focusing on automation, robotics, and real-time systems.

Course Outcomes
At the end of the course, the student will be able to…

CO NO	COURSE OUTCOME	BTL	PO	PSO
CO1	Explain the fundamental architecture and operation of microprocessors.	K4	5	1
CO2	Develop and implement microprocessor-based applications, focusing on areas such as automation, robotics, and real-time systems.	K4	6	2
CO3	Utilize development boards, simulation software, and other tools to design, test, and validate microprocessor systems.	K5	6	1
CO4	Manage memory organization, input/output interfacing, and interrupt handling in microprocessor-based systems.	K5	7	1
CO5	Interpret and produce detailed schematics, documentation, and reports for microprocessor-based projects.	K3	5	1

For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

CO-PO MATRIX									
CO NO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**
CO1					**3**			**2**	**1**
CO2						**3**		**2**	**1**
CO3						**2**		**3**	**1**
CO4							**3**	**1**	**2**
CO5					**3**			**2**	**2**

Use the codes 3,2,1 for High, Moderate and Low correlation Between CO-PO-PSO respectively

Course Structure

This lab list covers the key areas of a Microprocessor lab course, providing hands-on practice with using EMU software:

1: Data Transfer Instructions

- **Objective:** Understand and practice data transfer instructions.
- **Activities:**
  - **Lecture:** Explain data transfer instructions (e.g., MOV, PUSH, POP, XCHG).
  - **Lab Exercise:**
    - **Simple Programs:** Write and test programs to transfer data between registers, memory, and I/O ports.
    - **Practice:** Use simulation software to observe how data transfer instructions work in practice.

2: Logical Instructions

- **Objective:** Explore logical instructions and their usage.
- **Activities:**
  - **Lecture:** Detailed discussion of logical instructions (e.g., AND, OR, XOR, NOT, TEST).
  - **Lab Exercise:**
    - **Basic Programs:** Write programs to perform bitwise operations and test logical instructions.
    - **Analysis:** Use a simulator to visualize how logical operations affect data.

3: Arithmetic Instructions

- **Objective:** Learn and practice arithmetic instructions.
- **Activities:**
  - **Lecture:** Overview of arithmetic instructions (e.g., ADD, SUB, MUL, DIV).
  - **Lab Exercise:**
    - **Simple Programs:** Write and run programs to perform basic arithmetic operations and handle results.
    - **Testing:** Use the simulator to verify the correctness of arithmetic operations.

4: Branch Instructions

- **Objective:** Understand branch instructions and their applications.
- **Activities:**
  - **Lecture:** Explanation of branch instructions (e.g., JMP, CALL, RET, JZ, JNZ).
  - **Lab Exercise:**
    - **Control Flow Programs:** Write programs to demonstrate conditional and unconditional branching.
    - **Simulation:** Use a simulator to trace program execution and observe branching behavior.

5: Flag Manipulation Instructions

- **Objective:** Study instructions for flag manipulation.
- **Activities:**
  - **Lecture:** Discuss flag manipulation instructions (e.g., CLC, STC, CLI, STI, CLD, STD).
  - **Lab Exercise:**
    - **Flag Operations:** Write programs to manipulate and test the status of flags.
    - **Practical Application:** Observe how flag manipulation affects program execution and control.

6: Shift and Rotate Instructions

- **Objective:** Explore shift and rotate instructions.
- **Activities:**
  - **Lecture:** Explanation of shift and rotate instructions (e.g., SHL, SHR, ROL, ROR).
  - **Lab Exercise:**
    - **Shift and Rotate Programs:** Write and test programs that use shift and rotate instructions for data manipulation.
    - **Simulation:** Use tools to visualize the impact of these operations on data.

7: Loop Instructions and ALP Programs

- **Objective:** Learn loop instructions and write assembly language programs for specific tasks.
- **Activities:**
  - **Lecture:** Overview of loop instructions (e.g., LOOP, JCXZ).
  - **Lab Exercise:**
    - **Loop Programs:** Write programs using loop instructions to perform repetitive tasks.
    - **ALP Programs:** Implement and test assembly language programs for the following tasks:
      - **ADD:** Add two numbers.
      - **SUB:** Subtract two numbers.
      - **MUL:** Multiply two numbers.
      - **DIV:** Divide two numbers.
      - **LARGEST:** Find the largest number in a list.
      - **SMALLEST:** Find the smallest number in a list.

8: ARM Cortex-M Development Tools and Environment

- **Objective:** Familiarize with the development tools and environment for ARM Cortex-M microcontrollers.
- **Activities:**
  - **Lecture:** Introduction to ARM development tools and environments (e.g., Keil MDK, IAR Embedded Workbench, GCC).
  - **Lab Exercise:**
    - **Tool Setup:** Install and configure a development environment (e.g., Keil MDK or GCC).
    - **Hello World Program:** Write and compile a simple "Hello World" program to familiarize with the toolchain.

9: Hands-On Programming with ARM Cortex-M

- **Objective:** Gain practical experience programming ARM Cortex-M microcontrollers.
- **Activities:**
  - **Lecture:** Basics of programming in ARM assembly and C for Cortex-M.
  - **Lab Exercise:**

        - **C Programming:** Write and test simple programs in C for the Cortex-M microcontroller, focusing on basic I/O operations.
        - **Assembly Programming:** Write and test basic ARM assembly language programs.

Week 10: Introduction to ARM Cortex-M Core Architecture

- **Objective:** Understand the ARM Cortex-M core architecture, including its structure and functionalities.
- **Activities:**
    - **Lecture:** Overview of ARM Cortex-M core architecture, including the CPU core, pipelining, and key features.
    - **Lab Exercise:**
        - **Architecture Diagram:** Analyze or draw the block diagram of the ARM Cortex-M core.
        - **Simulation:** Use simulation tools to explore the Cortex-M architecture and its components.
        - **Lab Manual:**

1. [Manual - Author(s), Year of Publication, Title, Edition, Publisher]Supplied by the Department

References:

1. [Reference 1 - Author(s), Year of Publication, Title, Edition, Publisher]
2. [Reference 2 - Author(s), Year of Publication, Title, Edition, Publisher]

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SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA :: VIJAYAWADA-10

(An autonomous college in jurisdiction of Krishna University, Machilipatnam)

Model Question Paper

Title: **Introduction toARM micro controller**

MODEL PAPER

SECTION-A

Answer all Questions: 5x4=20M

1. a) Difference between 8085 and 8086. **k1**

(or)

b) Explain about Register organization. **k1**

2. a)Explain about machine language of 8086.**k2**

(or)

b) Write a instruction format 0f 8086.**k2**

3.a) Discuss about flag manipulation of 8086.**k2**

(or)

b) Describe about ALP format of 8-bit addition.**k2**

3.a)Explain about registers in ARM processor.**k3**

(or)

b) Discuss about Air thematic instruction in ARM processor.**k3**

5.a) Write about memory organization of ARM.**k2**

(or)

b) Discuss about ARM cortex-M.**k2**

SECTION-B

Answer all questions: 5x10=50M

6.a)Draw the Block diagram of 8085 microprocessor and explain each block in brief. **k2**

(or)

b) Draw the pin diagram of 8085 and explain each pin in detail. **k2**

7.a) Explain the architecture of 8086 and explain about each block in brief. **k2**

(or)

b) Explain about various addressing modes of 8086. **k2**

8.a) Discuss following instruction set in brief (i)Data transfer (ii)Air thematic. **k2**

(or)

b) Write an Alp program to find largest number in an array.**k2**

9.a)Explain about the architecture of ARM processor in brief. **k3**

(or)

b) Explain pipeline process in arm and Arm based MCU. **k3**

10.a) Explain about instruction set of ARM Processor. **k3**

(or)

b) Explain about interfacing of Seven segment display with ARM Processor. **k3**

SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA :: VIJAYAWADA-10

(An autonomous college in jurisdiction of Krishna University, Machilipatnam)

Model Question Paper

TITLE: INDUSTRIAL ELECTRONICS

Course Code: 22ELESETO1 **Maximum Marks: 70M**

Time: 3 Hours **Pass Minimum: 28M**

SECTION-A

Answer the following: 5X4=20M

1. (a) Discuss the functioning of half wave rectifier. K1

OR

(b) Explain the stunt capacitor. k2

2. (a) Explain the importance of RPS. K2

OR

(b) Describe half wave voltage doubler circuit. K2

3. (a) Mention some applications of voltage multipliers. K2

OR

(b) Write a short note on resistance heating effect. K2

4. (a) Give an account of SCR Half wave rectifiers. K1

OR

(b) Give the characteristics of IC7805 regulator k1

5. (a) Write some of the applications of Di-electric effect k2

OR

(b) Explain briefly about SCR applications k2

SECTION-B

Answer the following: 5X10=50M

6. (a) Explain full wave bridge rectifier, its efficiency and ripple factor with a neat sketch k3

OR

(b)Explain the operation of transistor series voltage regulator. K3

7. (a) Draw the block diagram of RPS and explain. K2

OR

(b)Draw the functional block diagram of SMPS and explain. K2

8. (a) Explain the operation of full wave voltage doubler and mention its applications. K3

OR

(b) Explain the operation of voltage tripler and mention its applications. K2

9. (a) Explain the construction, working of SCR and draw its characteristics. K2

OR

(b) Deduce the mathematical equations for resistive load of SCR full wave rectifier. K4

10. (a) Elaborate the operation of inductance heating and mention its applications. K3

OR

(b) Elucidate the operation of dielectric heating and mention its applications. K3

SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA :: VIJAYAWADA-10

(An autonomous college in jurisdiction of Krishna University, Machilipatnam)

Model Question Paper

TITLE: ELECTRONIC INSTRUMENTATION

Course Code: 22ELESETO2 **Maximum Marks: 70M**

Time: 3 Hours **Pass Minimum: 28M**

SECTION-A

Answer the following: 5x4=20M

1.(a) Define the terms (i)Accuracy (ii) Precision k1

OR

(b)Discuss different types of dynamic errors in the instrumentation. K2

2. (a) Draw and design Anderson's bridge k1

OR

(b)Write about the phase locked loop(PLL). K2

3. (a) Explain about thermos couple and characteristics. K3

OR

(b) Write a short notes on temperature transducers. K2

4. (a) Mention some applications of PLC. K2

OR

(b) Define the terms (i)Resolution (ii)Sensitivity. K1

5. (a) Explain about the ohm meter. K2

OR

(b) Differentiate between RTD and thermocouples. K1

SECTION-B

Answer the following: 5x10=50M

6. (a) Explain the block diagram of measurement system. K2

OR

(b)Explain the following terms in brief (a)Systematic errors (b)Random errors k2

7. (a) Explain about digital voltmeter system in brief k2

OR

(b)Discuss briefly about the measurement of frequency (Wein bridge) k3

8. (a) Define the principle and working characteristics of PLL. K1

OR

(b) Explain briefly about function generator. K2

9. (a) Draw the block diagram of Spectrophotometer and explain. K3

OR

(b) Define the principle and working characteristics of PH meter. K2

10. (a)Discuss briefly about Direct digital control. K2

OR

(b)Explain about the block diagram of PLC and it's operation. K3