PARVATHANENI BRAHMAYYA
SIDDHARTHA COLLEGE OF ARTS & SCIENCE
Autonomous
Siddhartha Nagar, Vijayawada–520010
Re-accredited at 'A+' by the NAAC

Course Code				**23IOMIL231**			
Title of the Course				**Introduction to ARM Microcontroller**			
Offered to: (Programme/s)				B.Sc. Hons Artificial Intelligence, BCA Hons (A & B)			
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	remember knowledge on microprocessors 8086 architectures and implement in practical application	K1	1	1
CO2	understand and device techniques for faster execution of instructions, improv speed of operation and enhance performance of microprocessor.	K2	1	1
CO3	apply various assembly language programs and test using moderate complexity.	K3	1	1
CO4	analyze the memory chips and peripheral chips for 16-bit 8086 microprocessor	K4	1	1
CO5	evaluate multi core processor and its advantages of ARMTDMIS.	K5	1	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	2							2	
CO2	2							2	
CO3	3							3	
CO4	3							3	
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) 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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P.B .SIDDHARTHA COLLEGE OF ARTS &SCIENCE

MODEL PAPER

23IOMIOL231: **Introduction to Arm Microcontroller**

Offered to: B.Sc. Hons Artificial Intelligence, BCA (A & B)

SECTION-A

Answer the following 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**

4. 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 the following 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**

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