BANGALORE UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING, UVCE, BENGALURU
B.Tech. PROGRAMME IN COMPUTER SCIENCE AND ENGINEERING

Course Code	**18CIPC404**					
Category	Engineering Science Courses : Professional Core					
Course title	**MICROPROCESSOR AND MICROCONTROLLER – THEORY**					
Scheme and Credits	No. of Hours/Week					Semester - IV CSE/ISE
	L	T	P	SS	Credits	
	2	2	0	0	3	
CIE Marks: 50	SEE Marks: 50		Total Max. Marks: 100			Duration of SEE: 03 Hours
Prerequisites (if any): NIL						

COURSE OBJECTIVES:

This course will enable students to

1. Make familiar with importance and applications of microprocessors and microcontrollers.
2. Discuss 8086 Microprocessor Instruction set.
3. Understand the working of 8255 Programmable Peripheral Interface.
4. Expose architecture of 8086 microprocessor and ARM processor.
5. Familiarize instruction set of ARM processor.

UNIT I: INTRODUCTION TO MICROPROCESSOR 10 Hours

The x86 microprocessor: Brief history of the x86 family, Inside the 8088/86, Introduction to assembly programming, Introduction to Program Segments, The Stack, Flag register, x86 Addressing Modes. Assembly language programming: Directives & a Sample Program, Assemble, Link & Run a program, More Sample programs, Control Transfer Instructions, Data Types and Data Definition, Full Segment Definition, Flowcharts and Pseudo code.

UNIT II: 8086 MICROPROCESSOR INSTRUCTION SET 10 Hours

x86: Instructions sets description, Arithmetic and logic instructions and programs: Unsigned Addition and Subtraction, Unsigned Multiplication and Division, Logic Instructions, BCD and ASCII conversion, Rotate Instructions. INT 21H and INT 10H Programming: BIOS INT 10H Programming, DOS Interrupt 21H. 8088/86 Interrupts, x86 PC and Interrupt Assignment.

UNIT III: 8255 PROGRAMMABLE PERIPHERAL INTERFACE 09 Hours

8255 Pin descriptions, Architecture, Control register, Mode 0, Mode 1 and Mode 2 Operations, Interfacing of DAC and ADC to 8086 in Mode 0 only. 8255 I/O programming: I/O addresses MAP of x86 PC's, programming and interfacing the 8255. 8253 – Programmable timer, pin functions, architecture, Mode 0, 1, 2, 3, 4, and 5 operations, Programs for monostable and astable operations.

UNIT IV: INTRODUCTION TO MICROCONTROLLER 10 Hours

Microprocessors versus Microcontrollers, ARM Embedded Systems: The RISC design philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software, ARM Processor Fundamentals: Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table, Core Extensions.

UNIT V: ARM INSTRUCTION SET **09 Hours**

Introduction to the ARM Instruction Set: Data Processing Instructions, Branch Instructions, Software Interrupt Instructions, Program Status Register Instructions, Coprocessor Instructions, Loading Constants, Simple programming exercises.

TEXT BOOKS:

1. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Danny Causey, The x86 PC Assembly Language Design and Interfacing, 5th Edition, Pearson, 2013.
2. Andrew N Sloss, Dominic Symes and Chris Wright, ARM System Developers Guide, Elsevier, Morgan Kaufman publishers, 2008.

REFERENCE BOOKS:

1. Venugopal K R and Rajkumar, Microprocessor x86 Programming, BPB Publications, New Delhi, 2017.
2. K M Bhurchandi and AK Ray, Advanced Microprocessors and Peripherals, 3rd Edition, McGraw Hill, 2017.
3. Douglas V. Hall, Microprocessors and Interfacing, Revised 2nd Edition, Tata McGraw Hill, 2006.
4. K. Udaya Kumar and B.S. Umashankar, Advanced Microprocessors & IBM-PC Assembly Language Programming, Tata McGraw Hill, 2003.

e-BOOKS/ONLINE RESOURCES:

1. Microprocessor, https://lecturenotes.in/subject/21/microprocessor-mp.
2. https://www.smartzworld.com/notes/microprocessors-and-microcontrollers-mpmc/.
3. https://easyengineering.net/microprocessor-and-microcontroller-system-by-godse/.

MOOCs:

1. Microprocessors and Microcontrollers - NPTEL - PDF Drive, https://www.pdfdrive.com/microprocessors-and-microcontrollers-nptel-e17318114.html

COURSE OUTCOMES:

The students at the end of the course, will be able to

CO1: Differentiate between microprocessors and microcontrollers.
CO2: Design and develop assembly language code to solve problems using 8086 microprocessors.
CO3: Gain the knowledge for interfacing various devices to x86 family and ARM processor.
CO4: Demonstrate the design of interrupt routines for interfacing devices.
CO5: Apply the instructions of ARM processor to develop applications.

SCHEME OF EXAMINATION:

<table>
<tr><td rowspan="2">CIE – 50 Marks</td><td>Test I (Any Three Units) - 20 Marks</td><td>Quiz I – 5 Marks</td><td>25 Marks</td><td rowspan="2">Total: 50 Marks</td></tr>
<tr><td>Test II (Remaining Two Units) - 20 Marks</td><td>Quiz II – 5 Marks</td><td>25 Marks</td></tr>
<tr><td rowspan="3">SEE – 100 Marks</td><td colspan="2">Q1 (Compulsory): MCQs or Short answer type questions for 15 Marks covering entire syllabus.</td><td>15 Marks</td><td rowspan="3">Total: 100 Marks</td></tr>
<tr><td colspan="2">Q2 & Q3 from Units which have 09 Hours are compulsory.</td><td>17 * 2 = 34 Marks</td></tr>
<tr><td colspan="2">Q4 or Q5, Q6 or Q7 and Q8 or Q9 from Units which have 10 Hours shall have Internal Choice.</td><td>17 * 3 = 51 Marks</td></tr>
</table>

Note: SEE shall be conducted for 100 Marks and the Marks obtained is scaled down to 50 Marks.

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<table>
<tr><td>Course Code</td><td colspan="6">18CIPC408</td></tr>
<tr><td>Category</td><td colspan="6">Engineering Science Course : Professional Core</td></tr>
<tr><td>Course title</td><td colspan="6">MICROPROCESSOR AND MICROCONTROLLER - LABORATORY</td></tr>
<tr><td rowspan="2">Scheme and Credits</td><td colspan="5">No. of Hours/Week</td><td rowspan="2">Semester - IV CSE/ISE</td></tr>
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<tr><td></td><td>0</td><td>0</td><td>3</td><td>0</td><td>1.5</td><td></td></tr>
<tr><td>CIE Marks: 50</td><td colspan="2">SEE Marks: 50</td><td colspan="3">Total Max. Marks: 100</td><td>Duration of SEE: 03 Hours</td></tr>
<tr><td colspan="7">Prerequisites (if any): NIL</td></tr>
</table>

COURSE OBJECTIVES:

This course will enable students to

1. Learn 8086 instruction sets and gains the knowledge of how assembly language works
2. Provide practical exposure to the students on microprocessors, design and coding knowledge on 80x86 family/ARM.
3. Understand the usage of 8255 Programmable peripheral Interface with I/O devices and Microprocessor.
4. Give the knowledge and practical exposure on connectivity of the Hardware devices to Microprocessor
5. Know how to execute the programs on interfacing devices with 8086/ARM kit like LED displays, Keyboards, DAC/ADC, and various other devices.

DESCRIPTION:

- Develop and execute the following programs using 8086 Assembly Language. Any suitable assembler like MASM/TASM/8086 kit or any equivalent software may be used.
- Program should have suitable comments.
- The board layout and the circuit diagram of the interface are to be provided to the student during the examination.
- Software Required: Open source ARM Development platform, KEIL IDE and Proteus for simulation.

SOFTWARE PROGRAMS: PART A

1. Design and develop an assembly language program to search a key element "X" in a list of 'n' 16-bit numbers. Adopt Binary search algorithm in your program for searching.
2. Design and develop an assembly program to sort a given set of 'n' 16-bit numbers in ascending order. Adopt Bubble Sort algorithm to sort given elements.
3. Develop an assembly language program to reverse a given string and verify whether it is a palindrome or not. Display the appropriate message.
4. Develop an assembly language program to compute nCr using recursive procedure. Assume that 'n' and 'r' are non-negative integers.

5. Design and develop an assembly language program to read the current time and Date from the system and display it in the standard format on the screen.
6. To write and simulate ARM assembly language programs for data transfer, arithmetic and logical operations (Demonstrate with the help of a suitable program).
7. To write and simulate C Programs for ARM microprocessor using KEIL (Demonstrate with the help of a suitable program)

HARDWARE PROGRAMS: PART B

8. Design and develop an assembly program to demonstrate BCD Up-Down Counter (00-99) on the Logic Controller Interface.
9. Design and develop an assembly program to read the status of two 8-bit inputs (X & Y) from the Logic Controller Interface and display X*Y.
10. Design and develop an assembly program to display messages "FIRE" and "HELP" alternately with flickering effects on a 7-segment display interface for a suitable period of time. Ensure a flashing rate that makes it easy to read both the messages (Examiner does not specify these delay values nor is it necessary for the student to compute these values).
11. Design and develop an assembly program to drive a Stepper Motor interface and rotate the motor in specified direction (clockwise or counter-clockwise) by N steps (Direction and N are specified by the examiner). Introduce suitable delay between successive steps. (Any arbitrary value for the delay may be assumed by the student).
12. Design and develop an assembly language program to generate the Sine Wave using DAC interface (The output of the DAC is to be displayed on the CRO).
13. Design and develop an assembly language program to generate a Half Rectified Sine waveform using the DAC interface. (The output of the DAC is to be displayed on the CRO).
14. To interface LCD with ARM processor-- ARM7TDMI/LPC2148. Write and execute programs in C language for displaying text messages and numbers on LCD
15. To interface Stepper motor with ARM processor-- ARM7TDMI/LPC2148. Write a program to rotate stepper motor.

COURSE OUTCOMES:

The students at the end of the course, will be able to

CO1: Use 8086 instruction sets and gains the knowledge of how assembly language works.
CO2: Design and implement programs written in 80x86 assembly language.
CO3: Know functioning of hardware devices and interfacing them to x86 family.
CO4: Gain the knowledge of 8255 PPI interfacing with I/O devices and Microprocessor.
CO5: Choose processors for various kinds of real world applications.

SCHEME OF EXAMINATION:

Continuous Internal Evaluation (CIE) Laboratory - (50 Marks)	**Marks**	**Semester End Evaluation (SEE) Laboratory - (100 Marks)**	**Marks**
Performance of the student in the laboratory, every week	20	Write up	20
Test at the end of the semester (Part A + Part B)	20	Execution of one program each from Part A and Part B	60
Viva voce	10	Viva voce	20
Total	**50**	**Total**	**100**

Note: SEE shall be conducted for 100 Marks and the Marks obtained is scaled down to 50 Marks.

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