Pokhara University Faculty of Science and Technology	
Course Code: CMP XXX (3 Credit)	Full Marks: 100
Course Title: Microprocessor and ALP(L-T-P)	Pass Mark: 45
Nature of the Course: Theory and Practical	Total Lectures: 45 hours
Level: Undergraduate Year: Second Semester: III	Program: B E

1. Course Description:

This course introduces microprocessor architecture and microcomputer system, including memory and input/output interfacing devices .It includes assembly language programming, bus architecture, bus cycle types, I/O systems, memory systems, interrupts. This course explores the inner workings of a microprocessor from the programmer's perspective and several laboratory exercises will be based on a microprocessor utilizing the assembly language.

2. General Objectives:

The main objective of the courses are:

- To know architecture and organization and addressing modes of a INTEL Microprocessor (8085/8086).
- To Introduce Basic operations, programming and application of Microprocessor.
- To design and analyze assembly programming code to use the branching structures, looping structures, flags, stacks, procedures, macros, and interrupts.
- To Interface memory and I/O devices with the Microprocessor.
- To develop a good understanding of the microprocessor operation and how they can be used as building blocks for automated systems and control applications.

3. Methods of Instructions:

- Lecture
- Tutorial
- Discussion
- Laboratory Work

Content in Detail

Specific Objectives	Content
• State and interpret block diagram of a Microprocessor based system and explain the function of each component ,the line of communication Bus	**Unit1: Introduction to Microprocessor (3 hrs.)** 1.1Historical evolution of INTEL series Microprocessor 1.1 Bus organization of a microprocessor 1.2 Microcontroller and its applications 1.3 Microcomputer 1.3.1 Von Neumann and Harvard Architecture 1.4 Concept of fetch, decode and execution

• Describe the function of each block of the 8085 microprocessors • Explain the bus timings in fetching an instruction from memory . • Explain the addressing Mode • Explain the function of data transfer instruction, Arithmetic instruction, logical and conditional and unconditional instruction. • Enable to write ALP. • Generation of control signal	**Unit 2: Architectural Details and Programming of 8085 microprocessor [12hrs]** 2.1 Internal Architecture and features of 8085 Microprocessor 2.2 Intel 8085 Instruction Set 2.3 Classification of Intel 8085 Instruction 2.3.1 Data Transfer Instruction, 2.3.2Arithmetic Instruction 2.3.3 Logical Instruction, 2.3.4Branching Instruction and 2.3.5Stack, I/O and Machine control Instruction 2.4 Addressing Modes of 8085 and its types 2.5 Instruction Cycle, Machine Cycle and T-State 2.6 Timing Diagram 2.6.1 Opcode fetch Cycle 2.6.2 Memory Read Cycle 2.6.3 Memory Write Cycle 2.6.5 I/O Read Cycle 2.6.5 I/O Write Cycle 2.7 Assembly Language Program 2.7.1 Format of an Assembly Language Instruction 2.7.2 Simple Programs with Arithmetic and Logical Operations ,Conditions and Loops

• Interpret the block diagram of an 8086 Microprocessor and explain the function of each component. • Understand the concept of memory segmentation and anys of physical addressing and effective addressing • Knowledge of real instructions and pseudo instructions • Enable to write advance programming in ALP • Analyze the concept of modular programming	**Unit 3 Architectural Details and programming of 8086 microprocessor [10hrs]** 3.1 Internal Architecture and features of 8085 Microprocessor 3.1.1 BIU and EU 3.1.2 Memory Segmentation 3.1.2.1 Segment and Offset Address 3.2 Intel 8086 Instruction Set 3.3 Classification of Intel 8085 Instruction 3.3.1 Data Transfer Instruction, 3.3.2Arithmetic Instruction 3.3.3 Logical Instruction, 3.3.4Branching Instruction 3.3.5 String manipulation Instruction 3.3.6 Machine control Instruction 3.5 Addressing Modes of 8086 and its types 3.5 Assembly Language program 3.5.1 Format of an assembly language Instruction 3.5.2 ALP Development Tools: Editor, Assembler, Linker, Debugger, Locator, Emulator 3.5.3 Assembler Directives 3.5.4 DOS Interrupt function(Keyboard and display services) 3.5.5Simple Programs for Arithmetic, Logical, String Input/Output, Conditions and Loops 3.5.6 Stacks Procedures 3.5.7 Macros program design
• Understand the concept on types of memory and its bus connection with microprocessor • Explain the difference between the peripheral mapped and memory-mapped technique • Interface and I/O device to a microcomputer by using logic gates and MSI Chip, such as decoders, latches and buffers. • Explain the Full Address decoding and partial decoding • List the element of the 8255 programmable peripheral interface (PPI)and explain its various operating modes and control word • Explain the process of the Direct Memory Access (DMA) and the	**Unit 4 Bus Structure, Memory, I/O and Interfacing [12 hrs.]** **4.1 Bus Structure** 4.1.1 Synchronous Bus 4.1.2 Asynchronous Bus 4.2 Memory Device Classification and Hierarchy **4.3 Interfacing I/O and Memory** 4.3.1 Address Decoding 4.3.2 Unique and Non-Unique Address Decoding 4.3.3 I/O Mapped I/O and Memory mapped I/O 4.3.4 I/O Address Decoding (8085) 4.3.5 Memory Address Decoding (8085) **4.4 Parallel Interface** 4.4.1 Modes: Simple I/O, Strobe I/O, Single Handshaking and Double Handshaking 4.4.2 Programmable Peripheral Interface (PPI) 4.4.2.1 Architecture of Intel (8255-PPI) **4.5 Serial Interface**

function of various elements of the 8237.	4.5.1 Synchronous and Asynchronous Transmission 4.5.2 Programmable Communication Interface 4.5.2.1 USART (8251) 4.6 DMA and Intel 8237A DMA Controller
• Apply and analyze an Interrupt process and the difference between Maskable and Non Maskable Interrupt • Apply and analyze the instruction EI, DI, and RST and their function in the 8085-interrupt process. • Apply and analyze the concept of interrupt subroutine program • Apply and analyze the concept of interrupt processing • Apply and analyze the features of the PIC 8259	**Unit 5 Interrupt Operation [8 Hrs.]** 5.1Interrupt , sources of interrupt and its Classification 5.2 Interrupt Processing Sequence in 8085/8086 5.3 Interrupt Instruction 5.3.1 Interrupts pins and priorities 5.3.2 Interrupt Service procedure 5.3.3 Interrupt Vector Table 5.3.4 Multiple Interrupt Handling 5.3.4.1 Polled and Vectored interrupt 5.3.5 Programmable Interrupt Controller (PIC) Intel (8259) and its Architecture

5 List of Tutorials

The following tutorial activities of 15 hours per group of maximum 24 students should be conducted to cover all the required contents of this course:

SN	Tutorials
1.	Timing Diagram of 8085
2.	Calculation of Starting and ending address of memory for 8085
3.	Design an interfacing circuit/Address Decoding to interface different size of memory for 8085
4.	Design with input output interfacing with 8085
5.	Assembly Language Program in 8085 and 8086

6.Practical works (30 hours for a group of maximum 24 students)

SN	Practical
1.	Assembly language program using 8085 and 8086 microprocessor kit or simulator Program should comprise the use of all types of instructions and addressing modes
2.	The programming should include the concept of Arrays and the concept of Multiplications and Division operations on 8085Microprocessor

5. Evaluation System and Students' Responsibilities

Evaluation System

The internal evaluation of a student may consist of assignments, attendance, term-exams, lab reports and projects etc. The tabular presentation of the internal evaluation is as follows:

Internal Evaluation	Weight	Marks	External Evaluation	Marks
Theory		**30**	**Semester End Examination**	**50**
Attendance &Class Participation	10%			
Assignments	20%			
Presentations/Quizzes	10%			
Internal Assessment	60%			
Practical		**20**		
Attendance &Class Participation	10%			
Lab Report/Project Report	20%			
Practical Exam/Project Work	40%			
Viva	30%			
Total Internal		**50**		
Full Marks: 50 + 50 = 100				

Students' Responsibilities

Each student must secure at least 45% marks separately in internal assessment and practical evaluation with 80% attendance in the class in order to appear in the Semester End Examination. Failing to get such score will be given NOT QUALIFIED (NQ) to appear the Semester-End Examinations. Students are advised to attend all the classes, formal exam, test, etc. and complete all the assignments within the specified time period. Students are required to complete all the requirements defined for the completion of the course.

8. Prescribed Books and References

Text Books:

1. Ramesh S. Gaonkar, "Microprocessor Architecture, Programming and Application with 8085", 5th Edition 2002, Prentice Hall

References:

1. D. V. Hall, "Microprocessor and Interfacing, Programming and Hardware", 2nd Edition 1999, Tata McGraw Hill

4. John Uffenbeck, "Microcomputers and Microprocessors, the 8080, 8085 and Z-80 Programming, Interfacing and Troubleshooting" 3rd Edition 1999, Prentice Hall

5. Walter A. Triebel and Avtar Singh, "The 8088 and 8086 Microprocessors, Programming, Interfacing, Software, Hardware and Applications", 4th Edition 2003, Prentice Hall

6. Barry B. Brey, "The Intel Microprocessors", 8th Edition 2011, Pearson Education