KL UNIVERISTY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COURSE HANDOUT DOCUMENT

Program Name : B.Tech (Computer Science Engineering)

Year/Semester : II/IV
Course No. : CSC 210 & EMC 207
Course Title : Microprocessors and Interfacing
Course Structure : 3-0-2
Course Detail : Theory and Practical
Lecture Hours : 60
Course Coordinator : Prof S.Venkateswarlu
Instructors : Dr.T.V.Rao, Prof S.Venkateswarlu and Ch.Radhika Rani

I. PROGRAM DESCRIPTION:

Computer science and engineering is an emerging area in the latest technologies, the main objective is to prove the technical viability of the new technology, together with its possible economic advantages. Demonstration activities are expected to speed up the adoption of new software technologies by reducing the techno-economic uncertainties and risks associated with innovation and, to enhance the attractiveness of new software approaches in industries and organizations. To analyze the ethical, social and legal issues raised by specific applications of Computer science and engineering in taking account of public policy deliberations. Disciplinary and Inter disciplinary approaches of selected topics will be promoted, particularly as regards: Digital systems design, Microprocessors, Embedded systems, Real time systems, and alternative methods for production of value added products.

II PROGRAM OBJECTIVES:

Programme objective can be broadly defined on five categories as below.

1. **Preparation**: To prepare students to fit into any industry/research associated with developing and implementation of software products, to make the students get ready in understanding the application of technology in applications and interdisciplinary areas of Computer Science and Engineering and to create an impact on the global and economical requirements of the country and act accordingly.

2. **Core Competence**: To endow students with a concrete foundation of basic and applied aspects of Computer Science and Engineering to carry out independent research in core and allied areas of Computer Science and Engineering.
3. **Breadth**: To nurture students with in-depth scientific and technical knowledge so as to plan, realize, Understand, investigate and produce quality products and suggest appropriate remedies to meet the contemporary problems round the globe
4. **Professionalism**: The instruction should emphasize the primary purpose of the profession as being the pursuit of a learned art in the spirit of public service. The sense of professionalism should convey the responsibility to evaluate the impact of the opportunity and obligation of the practitioner, to be in concert with peers, guides, and direct the profession.
5. **Learning Environment**: To create an ambience to the learner where he can put into practice his scientific and technical skills to gain confidence in his area of study/work, prone with ethical standards and good practices.

After the successful completion of the Programme the students will demonstrate the following characteristics that are referred to as Programme Outcomes.

III PROGRAM OUTCOMES

a. The student will demonstrate an ability to communicate effectively in all forms.
b. The student will demonstrate an ability to work in teams to accomplish common Goal.
c. The student will demonstrate basic theoretical concepts.
d. The student will demonstrate an ability to use tools, which are frequently used in the Industry.
e. The student will demonstrate an ability to apply mathematics in various computing and data processing applications.
f. The student will develop applications from inception to implementation.
g. The student will demonstrate an ability to analyze and develop real life applications in different domains.
h. The student will develop confidence in self-learning and life long learning.
i. The student will demonstrate an ability to achieve campus placement.
j. The student will demonstrate an ability to move to graduate programs either in

India or abroad.

k. The student will demonstrate Knowledge of professional and ethical responsibilities.

To check the Teachers' intent (at the beginning of the Programme) and the students' performance at the end of the Programme, Programme Objectives are mapped with Programme Outcomes as given under:

Mapping of the Program Objectives with Program Outcomes.

		Program Outcomes										
		a	b	c	d	e	f	g	h	i	J	k
Program Objectives	1	√	√	√	√					√		√
	2		√	√			√					√
	3			√	√	√	√	√		√		
	4							√	√		√	√
	5			√	√		√			√	√	

IV. COURSE DESCRIPTION

Microprocessor and interfacing is an undergraduate Computer Science and Engineering course. The objectives of this course are to introduce the fundamental theory of microprocessors; the instruction set architecture of 8086 and I/O interfacing with 8086 and assembly program development. This course will enable student to build the applications that runs on the system and may provide challenging and rewarding carrier opportunities for the student. Today's users want applications with fast processing applications and communicate with other applications and they will insist on increasing the processors and system clock rates and architectures.

V. SCOPE AND OBJECTIVE OF THE COURSE

The purpose of the microprocessor is to give an in-depth study of both the hardware and software included in microcomputer systems. The concepts are based on a particular microprocessor, the Intel 8086, and its associated supporting devices and software and assembly language programming.

After thorough learning of this course the student:

1. To make the students to understand theoretical foundation of microprocessor especially, 8086,80186,80286,80386 and Pentium processor
2. To make the students to develop different types of applications in assembly language using 8086 instruction set.
3. To make student to become hands on TASAM/MASAM assembler for the development of programs in assembly language
4. To make the student analyze various types of interfacings of peripheral devices with microprocessors.
5. To understand some of the topics of course by student themselves.
6. The student must learn the advanced microprocessors architectures especially Dual-core and Quad-Core.
7. Student must be able apply Boolean algebra and decimal mathematical foundation for solving problems using microprocessor.

VI. COURSE OUTCOMES

After the successful completion of this course, the students should be able:

1. To carry basic arithmetic operations in various number systems.
2. To learn about various error detecting and correcting codes
3. To apply basic Boolean postulates to simplify Boolean expressions.
4. To apply the K-map (karnaugh) map to simplify Boolean expressions.
5. To analyze and design various combinational logic circuits such as adders, sub tractors, comparators, decoders, multiplexers and logic arrays.
6. To analyze and design various sequential circuits such as registers, counters, RAM (Random Access Memory), and control circuits.

7. To understand the basic functional units, operational concepts and basic memory operations, addressing modes.

Finally the Microprocessor and interfacing will help to have deeper knowledge in other computer related courses like Embedded systems and Real time systems, etc., for the student.

Mapping of Course Objectives with Programme Outcomes

		Program Outcomes										
		a	b	c	d	e	f	g	h	i	j	k
Course Objectives	1	√	√		√				√			√
	2			√	√	√		√			√	
	3	√	√			√	√				√	
	4	√		√			√	√		√		
	5		√	√	√		√				√	
	6	√			√				√	√		√
	7		√			√			√	√		√

Text Book

1. Douglas V Hall, "Micro processors and Interfacing", Tata McGraw Hill publications, 2nd edition, 2006.

Reference Books

1. Brey, "Intel Microprocessors –The 8086, 8088, 80186, 80286, 80386, 80486 Architecture, Programming & Interfacing", 2nd Edition, PHI, 2005.
2. Yu-Cheng Liu and Glenn A. Gibson, "Microcomputer Systems: The 8086/8088 Family Architecture, Programming and Design", 2nd Edition; PHI..1995.

VII. SYLLABUS

UNIT – I

Introduction: Microprocessor evolution and types, 8086 family overview, 8086 internal architecture, introduction to programming 8086. Programming structure and

representation formats, finding right instructions, writing a program, addressing modes, Standard programming structures.

UNIT II

8086 string instructions, writing and using procedures, writing and using assembler macros, 8086 instruction description and assembler directives, 8086 microcomputer system, Bus structure, minimum mode of operation.

UNIT III

Interrupts and interrupt responses, 8259A priority interrupt controller, programmable parallel ports and hand shake input and output, interfacing processor to 8255A, interfacing microprocessor to keyboards, interfacing microprocessor to a stepper motor.

UNIT IV

Bus structure : Maximum mode of operation, Direct memory access Data transfer(DMA), Interfacing with 8251A(USART), 8087 numeric data processors.

UNIT V

Multi-user/Multitasking operating concepts, the Intel 80286 microprocessor, the Intel 80386 32-bit microprocessor, the Intel 80486 microprocessor, an introduction to Pentium processor concepts: super scalar architecture.

VIII. SELF LEARNING MATERIAL

S.No	Unit	Topic	Reference
1	I	Representing program operations	Text Book, Chapter three
2	I	Constructing the machine code for the 8086	Text Book, Chapter three

		instructionds	
3	II	Addressing Memory and ports in microcomputer systems	Text Book, Chapter seven
4	III	Programmable parallel ports and handshake I/O	Text Book, Chapter Nine
5	IV	8087 Instruction descriptions	Text Book, Chapter Eleven
6	V	80286 Real and protected mode operation	Text Book, Chapter Fifteen
7	V	The Pentium M Processors for mobile applications	Text Book, Chapter Fifteen

IX. UNIT WISE RATIONALIZATION

UNIT-I : Programming approach in microprocessor is used to solve the problem, write an algorithm for the solution, and then simply translate the algorithm to assembly language. This approach is much more likely to produce a working program than writing down assembly language instructions.

This unit is used to enable the students to understand and write structured assembly language programs for the 8086 microprocessor.

UNIT-II : Instruction sets and Assembly language directives are used in writing the assembly language programs of your own. Provides signals, timing, and system connections for a simple microcomputer.

This unit provides a systematic method for troubleshooting a malfunctioning 8086- based microcomputer system and the use of a logic analyzer to observe microcomputer bus signals.

UNIT-III : Most microprocessors allow normal program execution to be interrupted by some external signal or by a special instruction in the program. Interfacing approach is required to interface a microprocessor with a wide variety of low-level input and output devices.

This unit enables the student to understand 8086 interrupt types, shows how the microprocessors in the 8086 family respond to interrupts, teaches how to write interrupt- service routines and describes how interrupts are used in a variety of applications and shows how a microprocessor is interfaced with digital devices such as keyboards and displays.

UNIT- IV : Direct Memory Access is needed for transfer of data between the I/O processor and the memory without the intervention of the CPU. Many microcomputer programs, such as those used for scientific research, engineering, business, and graphics need to make mathematical calculations such as computing the square root of a number, the tangent of a number, or log of a number.

This unit describes motherboard circuitry, including DMA systems, caches, math coprocessors, and peripheral interface buses. Provides the knowledge of electronic design automation tools that is essential in developing high-speed microprocessor systems.

UNIT-V : The 80286 is another 16-bit enhancement of the 8086 and the 80386, 80486 are the 32-bit enhancements of the 8086 processor. Intel came up with the next generation of the IA-32 family of processors with the Pentium processor

This unit describes the needs that must be met by a multi-user/ multitasking operating system and then describes how the protected-mode features of the 80286,80386, 80486 and the Pentium processors and their architectures.

X. SESSION PLAN

S.No	*Unit*	*Session*	*Content*	*Learning objective*	*Methodology*	*Faculty Approach*	*Student approach*	*Learning outcome*
1	**I**	1	Microprocessor evolution, dedicated or embedded controllers, bit-slice processors and general purpose CPUs	Microprocessor evolution and types	Oral	Facilitates	Listens and participate	Understand
2	**I**	**2**	Introduction to 8086,8088,80186,80286,80386,80486 and Pentium processors	Overview of the 8086 microprocessor family	PPT/Board	Explanation	practice	Practice and Explore the mechanism
3	**I**	**3**	Internal block diagram of 8086, flag register format and general purpose registers	8086 internal architecture	PPT/ Board	Explanation	Listens and participate	Practice and Explore the mechanism
4	**I**	**4**	Programming languages, few addressing modes and accessing data in memory	Programming the 8086	PPT/ Board	Explanation	Listens and observe	Understand
5	**I**	**5**	Sequence, if-then-else, if-then, case, while-do and repeat-until structures	Standard Programming structures and representation forms	PPT	Explanation	Listens and observe	Understand
6	**I**	**6**	Data transfer instructions, arithmetic instructions	Finding the right instruction	PPT	Explanation	Listens and participate	Understand and Analyze
7	**I**	**7**	Bit manipulation instructions, String instructions	Finding the right instruction	PPT	Explanation	Listens and participate	Understand and Analyze

8	**I**	**8**	Program execution transfer instructions, Processor control instructions	Finding the right instruction	PPT	Explanation	Listens and observe	Understand
9	**I**	**9**	Initialization instructions, a standard program format and documentation	Writing an assembly language program	PPT	Explanation	Listens and observe	Understand
10	**I**	**10**	Different types of addressing modes	Addressing modes	PPT	Explanation	Listens & observe	Application
11	**I**	**11**	Simple sequence programs	Implementation of standard program structures in 8086 assembly language	PPT	Explanation	Listens and observe	Application
12	**I**	**12**	Jumps, flags and conditional jumps	-do-	PPT/Board	Explanation	Listens and participate	Practice and Explore the mechanism
13	**I**	**13**	If-then, if-then-else, multiple if-then-else, and while-do programs	-do-	PPT/Board	Explanation	Listens and participate	Practice and Explore the mechanism
14	**I**	**14**	Repeat-until programs and instruction timing and delay loops	-do-	PPT	Explanation	Listens and observe	Understand and remember
15	**II**	**15**	Introduction and operation of string instructions	The 8086 string instructions	Board	Explanation	Listens and participate	Application of Postulates of Boolean Algebra
16	**II**	**16**	The 8086 call and return instructions and the 8086 stack	Writing and using procedures	Board	Explanation	Listens and Practice	Application
17	**II**	**17**	Near procedures, passing parameters to and from procedures	-do-	Board	Explanation	Listens and Practice	Application

18	**II**	**18**	Writing and debugging programs containing procedures	-do-	Board	Explanation	Listens and Practice	Application
19	**II**	**19**	Writing and calling far procedures	-do-	Board	Explanation	Listens and Practice	Application
20	**II**	**20**	Procedures vs macros, defining &calling a macro	Writing and using assembler macros	Board	Explanation	Listens and Practice	Application
21	**II**	**21**	Data transfer instructions, arithmetic instructions,	Instruction descriptions	Board	Explanation	Listens and Practice	Application
22	**II**	**22**	bit manipulation instructions ,String instructions	-do-	PPT	Explanation	Listens and observe	Understand and remember
23	**II**	**23**	Program execution transfer instructions, Processor control instructions	-do-	Board	Explanation	Listens and Practice	Application
24	**II**	**24**	ASSUME,DB,DD,DQ ,DT,DW,END,ENDP, ENDS	Assembler directives	Board	Explanation	Listens and Practice	Application
25		**25**	EQU, EVEN, EXTRN, GLOBAL, GROUP, INCLUDE, LABEL, LENGTH,	-do-	Board	Explanation	Listens and Practice	Application
26	**II**	**26**	NAME, OFFSET, ORG, PROC, PTR, SEGMENT, SHORT, TYPE	-do-	Board	Explanation	Listens and Practice	Application
27	**II**	**27**	Block diagram of a simple 8086 based micro computer	8086 microcomputer system	PPT	Explanation	Listens and observe	Understand and remember

28	**II**	**28**	8086 bus activities during a read &write machine cycles	8086 bus activities	Board	Explanation	Listens and Practice	Application
29	**III**	**29**	Overview,8086 interrupt response, interrupt pointer table	8086 interrupts and interrupt responses	Board	Explanation	Listens and Practice	Application
30	**III**	**30**	Example for 8086 interrupt program	8086 interrupt program	PPT	Explanation	Listens and observe	Understand and remember
31	**III**	**31**	Divide by zero, single step, breakpoint , overflow & software interrupts	8086 interrupt types	PPT	Explanation	Listens and observe	Understand and remember
32	**III**	**32**	Internal block diagram of 8259A	8259A priority interrupt controller	PPT	Explanation	Listens and observe	Understand and remember
33	**III**	**33**	8259A initialization command word formats and sending order	8259A initialization	Board	Explanation	Listens and Practice	Understand and Practice
34	**III**	**34**	8259A operational command words	-do-	Board	Explanation	Listens and Practice	Understand and Practice
35	**III**	**35**	Methods of parallel data transfer and internal block diagram of 8255A	Parallel ports	PPT	Explanation	Listens and understand	Understand and Practice
36	**III**	**36**	Different modes for initializing 8255A	8255A operational modes & initialization	PPT	Explanation	Listens and observe	Understand and remember
37	**III**	**37**	Examples or 8255A handshake application	8255A handshake application	PPT	Explanation	Listens and observe	Understand and remember
38	**III**	**38**	Keyboard types	Interfacing a microprocessor to keyboards	PPT	Facilitates	Listens and observe	Understand and remember

39	**III**	**39**	Circuit connections and algorithms, code conversion , error trapping	Software keyboard interfacing	Board	Explanation	Listens and Practice	Remember and apply
40	**III**	**40**	Dedicated microprocessor keyboard encoders	Keyboard interfacing with hardware	Board	Explanation	Listens and Practice	Remember and apply
41	**III**	**41**	Four-phase stepper motor interface circuit and stepping waveforms	Interfacing a microcomputer to a stepper motor	Board	Explanation	Listens and Practice	Remember and apply
42	**IV**	**42**	Circuit showing the 8086 connections for MAX mode operation	The 8086 maximum mode	Board	Explanation	Listens and Practice	Remember and apply
43	**IV**	**43**	Block diagram of DMA controller	Direct Memory Access(DMA)	Board	Explanation	Listens and Practice	Remember and apply
44	**IV**	**44**	Circuit connections and operation of Intel 8237 DMA controller	Operation of Intel 8237 DMA controller	Board	Explanation	Listens and Practice	Remember and apply
45	**IV**	**45**	Overview, 8087 data types	8087 Math Coprocessor	Board	Explanation	Listens and Practice	Remember and apply
46	**IV**	**46**	Block diagram of the 8087 math coprocessor	8087 Architecture	Board	Explanation	Listens and Practice	Remember and apply
47	**IV**	**47**	Real transfers, integer transfers, packed decimal transfers and arithmetic operations	8087 instruction Set	Board	Explanation	Listens and Practice	Remember and apply
48	**IV**	**48**	Block diagram and pin descriptions for the Intel 8251A USART	8251A USART	PPT	Explanation	Listens and observe	Understand and remember
49		**49**	Initializing 8251A	-do-	PPT	Explanation	Listens and observe	Understand and remember
50	**V**	**50**	Scheduling, and	Multi-user/ Multitasking	PPT	Explanation	Listens and	Understand and

			accessing resources				observe	remember
51	**V**	**51**	Bank switching, expanded, extended, and virtual memory	Memory management	PPT	Explanation	Listens and observe	Understand and remember
52	**V**	**52**	Internal block diagram of 80286 microprocessor	The Intel 80286	PPT/Board	Explanation	Listens and observe	Understand and remember
53	**V**	**53**	80286 real address mode and protected mode operation	80286 mode operation	PPT	Explanation	Listens and observe	Understand and remember
54	**V**	**54**	80386 architecture, pins and signals	The Intel 80386	PPT	Explanation	Listens and observe	Understand and remember
55	**V**	**55**	The ISA and EISA bus standard and the micro channel architecture bus	80386 connections and interface buses	PPT	Explanation	Listens and observe	Understand and remember
56	**V**	**56**	80386 Real, protected and virtual mode operation.	80386 operating modes	PPT	Explanation	Listens and observe	Understand and remember
57	**V**	**57**	Set of 80386 instructions and programming	80386 instruction set	PPT	Explanation	Listens and observe	Understand and remember
58	**V**	**58**	Internal block diagram of 80486	The Intel 80486	PPT	Explanation	Listens and observe	Understand and remember
59	**V**	**59**	Architecture of Pentium processor	The Pentium processor	PPT	Explanation	Listens and observe	Understand and remember
60	**V**	**60**	The NetBurst architecture	-do-	PPT	Explanation	Listens and observe	Understand and remember

XI. EVALUATION PATTERN :

Internal Marks : 40

External Marks : 60

Evaluation Scheme

Evaluation Component	Dur.Min	Max marks	Date & Time
Test 1	50	10	
Test 2	50	10	
Quiz	50	5	
Assignment	50	10	
Attendance	Semester	5	
Comprehensive Examination	180	60	

Attendance Weightage 05 Marks

Attendance of 75 % and above but less than 80 % **01** Mark
Attendance of 80 % and above but less than 85 % **02** Marks
Attendance of 85 % and above but less than 90 % **03** Marks
Attendance of 90 % and above but less than 95 % **04** Marks
Attendance of 95 % and above **05** Marks

XII. GRADES

After successful completion of the Course work and all the internal and external examinations, a student will graded as follows

Letter	Qualitative Meaning	Grade Point Attached
X	- Excellent	10
A	- Very Good	8
B	- Good	7
C	- Fair	6
D	- Satisfactory	4
F	- Fail	0

XIII. NOTICES

ALL notices regarding this subject are displayed on the e-learning site only

Course Instructors :

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