



INSTITUTE OF AERONAUTICAL ENGINEERING

(AUTONOMOUS)
Dundigal, Hyderabad - 500 043

ELECTRICAL AND ELECTRONICS ENGINEERING COURSE DESCRIPTION FORM

Course Title	Microprocessors and Interfacing Devices			
Course Code	A60430 (R15)			
Academic Year	2017 - 2018			
Course Structure	Lectures	Tutorial	Practicals	Credits
	4	-	-	4
Course Coordinator	Mr.R Mahendhar Reddy, Associate Professor, ECE			
Course Faculty	Mr.R Mahendhar Reddy, Associate Professor, ECE			

I. COURSE OVERVIEW

Microprocessor and Microcontrollers course is intended to introduce the architecture, programming of microprocessors, microcontrollers and interfacing various hardware circuits to microprocessors and microcontrollers. The topics covered are architecture, addressing modes, instruction set of 8086 and 8051, minimum and maximum mode operation of 8086, Assembly language programming fundamentals, interfacing of static Ram, EPROM, DMA Controller, keyboard, display, 8279, stepper motor, A/D and D/A converter, 8259 interrupt controller, data transmission, 8251 USART, modes of timer operation of 8051, programming of Real time control by using basic microcontroller.

Understand need of microprocessors, microcontrollers in development of various projects and to know complete architectural, programming, interfacing details of 8086 microprocessor-8051 microcontroller.

II. PREREQUISITE(S)

Level	Credits	Periods / Week	Prerequisites
UG	4	6	Digital and switching circuits, COMPUTER ORGANIZATION, DLD

III. MARKS DISTRIBUTION

Session Marks	University End Exam Marks	Total Marks
<p>There shall be two mid tem examinations. Each midterm exam consists of subjective type and objective type test.</p> <p>The subjective test is for 10 marks, with duration of 1 hour. Subjective test of each semester shall contain four questions; the student has to answer two out of them. Each carrying 5 marks</p> <p>The objective test paper Is prepared by JNTUH, which consists of 20 questions each carrying 0.5 marks and total of 10 marks.</p> <p>The student is assessed by giving two assignments, one, after completion of 1 to 2 1/2 units and the second, after the completion of 2 1/2 to 5 units each</p>	75	100

<p>carrying 5 marks. On the total the internal marks are 25.</p> <p>The average of two internal tests is the final internal marks.</p> <p>The external question paper is set by JNTUH consisting of part –A and part-B. Where part consists of short answer questions carrying total marks of 25 and part part-B consists of 5 essay type questions consists of internal choice each carrying 10 marks and the total of 50. The total external marks are 75.</p>		
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IV. EVALUATION SCHEME

Sl. No	Component	Duration(Hrs)	Marks
1	I Mid Examination	80 min	20
2	I Assignment	--	5
3	II Mid Examination	80min	20
4	II Assignment	--	5
5	End Semester Examination	3hr	75

V. COURSE EDUCATIONAL OBJECTIVES:

At the end of the course, the students will be able to:

- I. Develop an in-depth understanding of the operation of microprocessors.
- II. Understand the assembly language programming using concepts like assembler directives, procedures, macros, and software interrupts etc.
- III. Create an exposure to basic peripherals, its programming and interfacing techniques
- IV. Understand the concept of Interrupts and their significance in 8086.
- V. Provide the basic concepts of programming in 8051 and understand the concept of Interrupts and their significance in 8051

VI. COURSE OUTCOMES:

After completing this course the student must demonstrate the knowledge and ability to:

1. Understand the internal Architecture and different modes of operation of popular 8086 microprocessors.
2. Understand the importance of addressing modes and the instruction set of the processor which is used for programming.
3. Analyze the assembly language programming using 8086
4. Design the I/O interfacing with 8086 microprocessor with 8255
5. Understand the memory organization and interrupts of processors/ micro-controllers helps in various system designing aspects.
6. Identify the significance of serial communication in 8086.
7. Analyze the architecture internal architecture of 8051 microcontroller
8. Identify the significance of interrupts / serial communication, real time functionality in 8051 with programming..
9. Analyze the memory organization of 8086 microprocessor
10. Identify the significance of Programmable Interrupt Controller interfaced with 8086.
11. Analyze DMA Controller interfacing with 8086 microprocessor.
12. Understand the Keyboard interfacing with 8086 microprocessor.
13. Design the Display interfacing with 8086 microprocessor
14. Analyze ADC interfacing with 8086 microprocessor
15. Identify the DAC interfacing with 8086 microprocessor with DAC
16. Design the interfacing with 8086 microprocessor with Stepper Motor
17. Understand how the Real time application of 8051 works.

VII. HOW COURSE OUTCOMES ARE ASSESSED

S. No	Outcome	Level	Proficiency assessed by
PO 1	Engineering Knowledge Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems	H	Lectures and problem solving
PO 2	Problem Analysis Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	H	Design Exercises and assignments
PO 3	Design/Development of Solutions Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations	H	Development of Mini Projects
PO 4	Conduct Investigations of Complex Problems Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions	H	Lab sessions, Exams
PO 5	Modern Tool Usage Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	S	Lectures and labs
PO 6	The Engineer And Society Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice	S	Oral discussions
PO 7	Environment and sustainability Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development	N	--
PO 8	Ethics Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice	N	--
PO 9	Individual and Team Work Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings	S	Group discussions
PO 10	Communication Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions	N	--
PO 11	Project management and finance Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments	S	Discussions, Exams
PO 12	Life-long learning Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change	S	Development of Mini Projects

VIII HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

PROGRAM SPECIFIC OUTCOMES		LEVEL	PROFICIENCY ASSESSED BY
PSO 1	Professional Skills: An ability to understand the basic concepts in Electrical & Electronics Engineering and to apply them to various areas, like Stepper Motors, Control Systems, Power Control Applications.	H	Lectures and Assignments
PSO 2	Problem-solving skills: An ability to solve complex Electronics and communication Engineering problems, using latest hardware and software tools, along with analytical skills to arrive cost effective and appropriate solutions.	S	Tutorials
PSO 3	Successful career and Entrepreneurship: An understanding of social-awareness & environmental-wisdom along with ethical responsibility to have a successful career and to sustain passion and zeal for real-world applications using optimal resources as an Entrepreneur.	S	Seminars and Projects

N - None

S - Supportive

H – Highly Related

IX SYLLABUS:

Unit-I

8086 Architecture: 8086 architecture- functional diagram, Register organization, memory segmentation, programming model, Memory addresses, physical memory organization, architecture of 8086, Signal descriptions of 8086-common function signals, timing diagrams, Interrupts of 8086.

UNIT-II

Instruction set and assembly language programming of 8086: Instruction formats. Addressing modes, instruction set, assembler directives. Macros, Simple programs involving logical, branch and call instructions. Sorting, evaluating arithmetic expressions, string manipulations.

UNIT-III

I/O Interface: 8255 PPI, various modes of operation and interfacing to 8086, interfacing of key board, display, D/A & A/D converter interfacing to 8086, Static and Dynamic memories, Interrupt structure of 8086, Vector interrupt table, Interrupt service routine. Introduction to DOS and BIOS interrupts, 8259, DMA Controller 8257 interfacing with 8086 microprocessor.

UNIT-IV

Communication Interface: Serial communication standards, serial data transfer schemes, 8251 USART architecture and Interfacing RS-232, IEEE-488, prototype and trouble shooting.

UNIT-V

Introduction to microcontrollers: overview of 8051 microcontroller, Architecture, I/O ports, Memory organization, addressing modes and instruction set of 8051, Simple programs.

TEXT BOOKS:

1. Advanced microprocessors and peripherals-A.K ray and K.M.Bhurchandani, TMH, 2nd edition 2006.
2. Microprocessors and Microcontrollers, Architecture, Programming and System Design, Krishnakant, PHI Learning PVT. Ltd

REFERENCES:

1. **D.V.Hall**, "Micro Processor and Interfacing", Tata Mcgraw-Hill.
2. "Microprocessors and Interfacing", **N.Senthil,Kumar,M.Saravanan,S. Jeevanathan,S.K.Shah**,Oxford University press
3. "Microprocessors, PC Hardware and Interfacing",**N.Mathivanan,PHI Learning PVT.Ltd**
4. "Microprocessors", **Nilesh B.Bahadure, PHI Learning PVT.Ltd**

5. "Micro Computer Systems: The 8086/8088 Family: Architecture, Programming and Design", Liu & Gibson, PHI.
6. Kenneth J Ayala, "The 8051 Micro Controller", Cengage learning
7. "The 8051 micro-controllers Architecture and Programming and Applications", K Umarao, Andhe pallavi, Pearson Education.
8. "Microcontrollers and Applications", Ajay V. Deshmukh, Tata McGraw-Hill Companies.

X. COURSE PLAN

At the end of the course, the students are able to achieve the following course learning outcomes (CLO):

Lecture Number	Unit	Course Learning Objective	Topics to be covered	Reference Number
1	Unit I		Introduction of MPMC	
2		Describe the basic architecture of 8085 microprocessor	Over view of 8085	R5:2.1
3-4		Describe the basic architecture of 8086	Architecture of 8086, Functional diagram	T3:1.2
5-6		List out the register organization	Register organization of 8086 , flag register structure	T3:1.1,1.2.2
7-8		Discuss the segmentation and programming model	Memory segmentation, memory address and physical memory	T3:1.4
9-12		Explain and interpret the fetch-decode-execute cycle and timing diagrams.	Pin diagram of 8086, Maximum and minimum mode of operations in 8086, timing diagrams	T3:1.3,1.8,1.9
13	Unit II	Identify instruction formats	Instruction format.	T3:2.1
14-15		Discuss & use addressing modes	Addressing modes of 8086	T3:2.2
16-18		Discuss & use the instruction set.	Instruction set of 8086.	T3:2.3
19		Explain macros, micros. Identify assembler directives.	Assembler directives, procedures, and macros.	T3:2.4T1:5 .1-5.20
20-21		Describe programs involving logical, branch and call instructions	Simple programs involving logical, branch and call instructions.	T3:2.4T1:5 .1-5.20
22-24		Describe Sorting, evaluating arithmetic expressions, string manipulations	Sorting, evaluating arithmetic expressions, string manipulations	T3:2.4T1:5 .1-5.20
25-26	Unit III	Explain how data can be transferred between different elements of a microprocessor-based system.	8255 architecture, operation and use, interfacing 8255 to 8086.	T3:5.4
27-28		Analyze the modes of operations	8255 PPI – various modes of operation	T3:5.5
29-30		Explain how peripherals can be interfaced to microprocessor-based system.	Interfacing Keyboard, Displays, Stepper Motor interfacing to 8086	T1:9.19T3:5.8

31		Describe the principles and operations of analogue-to-digital and digital-to-analogue converters.	D/A and A/D converter and interfacing to 8086.	T3:5.7,5.6
32-33	Unit III	Construct memory map and describe different types of memory.	Memory interfacing to 8086 (Static & Dynamic)	T3:5.1
34-36		Explain and describe 8086 interrupts, Illustrate service routines	Interrupt structure of 8086, vector interrupt table, Interrupt service routines, and interrupt types.	T1-8.1, T1-8.7
37-39		Describe & use of the PIC 8259	8259 architecture and interfacing to 8086	T3:6.4.3 T1:14.9,14.48
40-41		Explain & describe the architecture of the 8257.	8257 architecture and interfacing to 8086	T3:6.4,6.44
	UNIT- IV	Describe & use of the serial communication standards.	Serial data transfer schemes and standards, Asynchronous and Synchronous data transfer schemes	T3:6.4.3 T1:14.9,14.48
		Explain & describe the architecture of the 8251.	8251 USART architecture and interfacing to 8086	T3:6.4,6.44
		Explain & describe RS-232	RS-232 interfacing	
		Explain IEEE-488	USB ,Prototype and Trouble shooting	R1:6.5
42-44	Unit V	Differentiate between a microprocessor and microcontroller, explain the architecture of 8051.	See the differences between microprocessors and microcontrollers, Architecture of 8051 microcontroller, Pin diagram of 8051	T2:3.1
45-46		Describe register architecture	Register organization and flag structure in 8051	T2:3.1
47		Use and describe input/output ports	I/O ports in 8051 and operation of each port	T2:3.2
48-49		Describe different types of memory.	Memory organization of 8051	T2:3.3
50		Discuss the addressing modes	Addressing modes in 8051 with examples	T2:5.1
51-53		Discuss the instruction set.	Instruction set of 8051 with different addressing modes.	T2:6.1 to 6.6,7.1 to 7.6, 8.1 - 8.3
54-55		Develop assembly code for 8051 based operations	Simple programs related to 8051.	T2

XI: MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENT OF THE PROGRAM OUTCOMES

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III	S			S	S									S
IV	S		S											H
V	S	H			H							S	H	

XI: MAPPING COURSE LEARNING OBJECTIVES LEADING TO THE ACHIEVEMENT OF THE PROGRAM OUTCOMES:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	H	S	S									S	S	H	H
2	H	S	S												S
3	S	S		S	H					S		S	S	S	
4	H		S	S									H		S
5	S	H	S									S		H	H
6	S		S	S						S		S	S		S
7	S	H	S		H					S					
8	S	S			H							H	S	H	H
9			S	S									H		S
10	H		S	S									H		S
11	H		S	S									H		S
12	H		S	S									H		S
13	H		S	S									H		S
14	H		S	S									H		S
15	H		S	S									H		S
16	H		S	S									H		S
17	H		S	S									H		S

S = Supportive

H = Highly Related

Prepared By : Mr.R Mahendhar Reddy, Associate Professor, ECE

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