MICROCONTROLLERS AND DIGITAL SIGNAL PROCESSING

VI Semester: EEE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AEC022	Core	3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Understand the architecture of 8086 and 8051.
II. Design and develop programs for different applications using assembly language of 8051.
III. Develop skills for analyzing discrete signals and systems and apply discrete Fourier transform for frequency domain analysis along with the implementation of FFT.
IV. Design IIR and FIR filters, with given specifications, using different techniques.

COURSE OUTCOMES (COs):

CO1: Apply a basic concept of digital fundamentals to Microprocessor based personal computer system

CO 2 : Describe the architecture and instruction set of 8051 microcontroller

CO 3: Describe the architecture and instruction set of 8051 microcontroller and Design and implement 8051 microcontroller based systems.

CO 4: Analyze the fundamentals and concepts in assess the effect of LTI systems on signals passing through them in frequency and time domains.

CO 5: Discriminate the Fourier, Laplace and Z-transforms as appropriate for various signals and systems

COURSE LEARNING OUTCOMES (CLOs)

At the end of the course, the student will have the ability to:

1. Understand and Describe the evolution and basic architecture of 8086
2. Discuss the segmentation and programming model and List out the register organization
3. Understand the difference between microprocessors and microcontrollers
4. Understand and describe input/output ports of 8051 and register organization
5. Describe different types of memory like special function register for program memory and data memory
6. Discuss the addressing modes of 8051 microcontroller
7. Discuss the instruction set of 8051 microcontroller
8. Develop assembly language program for 8051 based operations.
9. Discuss and illustrate the Timers/counters, serial communication
10. Understand and discuss external memory
11. Understand and discuss clock circuits and i/o memory
12. Develop assembly code for real time control.
13. Develop assembly code for real time control to interfacing ADC and DAC
14. Understand the frequency domain representation and discrete Fourier transforms
15. Understand the FFT and FFT algorithms, inverse FFT and FFT with general radix- N.
16. Analyze and design of FIR digital filters
17. Analyze and design of IIR filters and digital filters using window techniques

UNIT - I	MICROPROCESSORS AND MICROCONTROLLERS	Classes: 08
Evaluation of processors, 8086 architecture, functional diagram, register organization, memory segmentation, microcontrollers, comparison of microprocessors and microcontrollers, microcontroller survey, 8051 architecture, pin diagram of 8051, I/O ports, memory organization, counters and timers, serial data input / output, interrupts.		
UNIT - II	**INSTRUCTION SET AND PROGRAMMING OF 8051**	**Classes: 09**
Addressing modes, Instruction set of 8051, programming of 8051, timers and counters, serial communication.		
UNIT - III	**8051 MICRO CONTROLLER DESIGN**	**Classes: 09**
Microcontroller design: External memory and memory space decoding, clock circuits, memory mapped I/O. Keyboard Interface, Seven segment numeric display interface, D/A and A/D converter interface to 8051.		
UNIT - IV	**INTRODUCTION TO DIGITAL SIGNAL PROCESSING AND FAST FOURIER TRANSFORMS**	**Classes: 10**
Discrete time signals and sequences, linear shift invariant systems, stability and causality, frequency domain representation of discrete time signals and systems, review of discrete Fourier transforms, fast Fourier transforms, radix2 decimation in time and decimation in frequency, FFT algorithms, inverse FFT and FFT with general radix- N.		
UNIT - V	**IIR AND FIR DIGITAL FILTERS**	**Classes: 09**
Analog filter approximations, Butterworth and Chebyshev, design of IIR digital filters from analog filters, step and impulse invariant techniques, characteristics of FIR digital filters, frequency response; Design of FIR digital filters: Fourier method, digital filters using window techniques.		

Text Books:

1. A K ray and K M Bhurchandani, "Advanced microprocessors and peripherals", Tata McGraw-Hill, 2nd Edition 2006.
2. Kenneth J Ayala, " The 8051 microcontroller",. Cengage learning, 3rd Edition 2010.
3. John G Proakis, Dimitris G Manolakis, "Digital signal processing, principles, Algorithms and applications", Pearson Education / PHI, 4th Edition. 2007.
4. V Oppenheim, R W Schaffer, "Discrete Time Signal Processing", Prentice Hall of India, New Delhi.

Reference Books:

1. D V Hall, "Microprocessors and Interfacing TMGH", 2nd Edition 2006
2. Liu and GA Gibson, "Micro computer system 8086 / 8088 family architecture, programming and design", PHI, 2nd Edition,
3. Ajay V Deshmukh, "Microcontrollers and application",. TMGH, 1st Edition, 2005
4. Loney Ludeman, John wiley, "Fundamentals of Digital signal processing", 1st Edition, 2009.
5. Li tan Elsevier, " Digital signal processing: fundamentals and applications", 1st Edition, 2008.

Web References:

1. http://www.nptel.ac.in/downloads/106108100/
2. http://www.the8051microcontroller.com/web-references
3. http://www.eceweb1.rutgers.edu/~orfanidi/ece348/
4. http://www.eecs.umich.edu/courses/eecs452/refs.html
5. http://www.dsp.sun.ac.za/lab-reference-guide/

E-Text Books:

1. https://www.books.google.co.in/books3
2. https://www.jntubook.com
3. https://www.ebooklibrary.org/articles/mpmc
4. https://www.dspguide.com/pdfbook.htm
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