COURSE TITLE	:	MICROCONTROLLERS
COURSE CODE	:	6132
COURSE CATEGORY	:	Α
PERIODS/WEEK	:	5
PERIODS/SEMESTER	:	75
CREDITS	:	5

TIME SCHEDULE

MODULE	TOPICS	PERIODS
1	AVR Microcontrollers & Assembly Language Programming	18
2	AVR Programming in C	18
3	Timer, Interrupt, Programming	19
4	Interfacing sub systems with AVR	20

Course General Outcomes:

SI.	G.O	On completion of this course the student will be able :		
1	1	To understand AVR Microcontrollers and its Architecture		
	2	To know AVR Assembly Language Programming		
	3	To apply Assembly Language Instructions in AVR		
2	1	To understand I/O Port Programming		
	2	To understand AVR Programming in C		
3	1	To understand Timer and Interrupt Programming		
4	1	To understand the interfacing of various systems with AVR microcontroller		

Specific Outcomes:

MODULE –I AVR Microcontrollers & Assembly Language Programming

1.1 To understand AVR Microcontrollers and its Architecture

- 1.1.1 To explain the basics of Microcontrollers
- 1.1.2 To Compare and contrast Microcontrollers and Microprocessors
- 1.1.3 To describe AVR family of Microcontrollers
- 1.1.4 To list the AVR features
- 1.1.5 To explain AVR Architecture with block diagram
- **1.2** To comprehend AVR Assembly Language Programming
 - 1.2.1 To state the usage of instructions in Data Memory
 - 1.2.2 To write AVR data formats
 - 1.2.3 To explain the Program counter and Program ROM space
 - 1.2.4 To explain the RISC and Harvard architecture in AVR

1.3 To apply Assembly Language Instructions in AVR

- 1.3.1 To Explain Branch instructions and looping
- 1.3.2 To Explain Call instructions and stack
- 1.3.3 To explain Time Delay Loop

MODULE – II AVR Programming in C

2.1 To Describe I/O Port programming

- 2.1.1 To explain I/O port programming in AVR
- 2.1.2 To explain I/O bit Manipulation Programming .

2.2 To understand AVR Programming in C

- 2.2.1 To list Data types in C
- 2.2.2 To explain Time Delays in C
- 2.2.3 To discuss I/O programming in C
- 2.2.4 To explain Logic Operations in C

MODULE - III Interfacing sub systems with AVR

3.1 To understand Timer and Interrupt Programming in C

- 3.1.1 To describe Timers 0,1, and 2 programming
- 3.1.2 To explain Counter Programming
- 3.1.3 To explain AVR interrupts
- 3.1.4 To illustrate Timer interrupts

MODULE – IV Interfacing sub systems with AVR

4.1 To understand the interfacing of various systems with AVR microcontroller

- 4.1.1 To explain AVR serial port programming
- 4.1.2 To Illustrate LCD interfacing
- 4.1.3 To Illustrate Keyboard interfacing
- 4.1.4 To Illustrate ADC interfacing
- 4.1.5 To Illustrate DAC interfacing
- 4.1.6 To Illustrate Sensor interfacing

CONTENT DETAILS

MODULE – I AVR Microcontrollers & Assembly Language Programming

Basics of Microcontrollers - Compare and contrast Microcontrollers and Microprocessors –Overview of AVR family of Microcontrollers - AVR features - AVR Architecture with block diagram – The general Purpose Registers in the AVR

AVR Data Memory-Using instructions with the Data Memory – AVR status Register - AVR data formats - Program counter and Program ROM space- RISC and Harvard architecture in AVR

Branch instructions and Looping- Unconditional branch instruction - Call instructions and stack – AVR Time delay and Instruction pipeline

MODULE – II AVR Programming in C

I/O port programming in AVR – I/O bit Manipulation Programming.
Data types and Time Delays in C - I/O programming in C –
Logic Operations in C- Data Conversion Prpograms in C – Data Serialization in C

MODULE – III Timer, Interrupt, Programming

Programming Timers 0, 1, and 2 - Counter Programming - AVR interrupts – Programming Timer Interrupts – Programming External Hardware interrupts – Interrupt priority in the AVR -

MODULE –IV Interfacing sub systems with AVR

Basics of Serial Communication – ATMEGA32 connection to RS232 - AVR serial port programming in C- LCD interfacing - Keyboard interfacing - ADC interfacing -- DAC interfacing - Sensor interfacing

Note: Assembly Language Programming is not necessary from Module II onwards.

TEXT BOOK:

1. The AVR Microcontroller and Embedded Systems Using Assembly and C By Muhammad Ali Mazidi, Sarmad Naimi, & Sepehr Naimi - Pearson Education

REFERENCES:

- 1. Introduction to Embedded Systems Shibu K.V, Mc Graw Hill.First Edition
- 2. Embedded C Michael J. Pont, Pearson Education, Second Edition
- 3. Embedded Systems Raj Kamal, , Mc Graw Hill, Second Edition

WEB SITE:

http://freevideolectures.com