COURSE TITLE : EMBEDDED SYSTEMS
COURSE CODE : 4051
COURSE CATRGORY : A
PERIODS/WEEK : 4
PERIODS /SEMESTER : 72
CREDITS : 4

TIME SCHEDULE

MODULE	TOPICS	PERIODS
1	AVR Microcontroller Architecture	18
2	Instruction sets of AVR Microcontroller	18
3	AVR Programming in C &Interrupts	18
4	Interfacing circuits using AVR	18
	Total	**72**

OBJECTIVES

MODULE I

1.1 Need for Microcontroller
1.1.1 Compare and contrast Microcontroller with general purpose Microprocessor
1.1.2 Role of Microcontroller in embedded market
1.1.3 Explain the concept of embedded systems
1.1.4 Embedded applications of general purpose Microprocessors
1.1.5 Criteria for choosing a Microcontroller
1.2 Over view of the AVR family
1.2.1 Features of AVR family
1.2.2 Comparison of various members of the AVR family
1.2.3 Block diagram of AVR Microcontroller
1.2.4 Compare the AVR with Microcontroller offered by other manufactures
1.3 List the General purpose registers of the AVR Microcontroller
1.4 Examine the data memory of the AVR Microcontroller
1.4.1 General purpose Registers
1.4.2 IO Memory (SFRs)
1.4.3 Internal data SRAM
1.4.4 SRAM vs EEPROM in AVR chips
1.5 Explain the purpose of the AVR status register
1.5.1 Discuss data RAM memory space allocation in the AVR Microcontroller

MODULE II

2.1 Programming of AVR Microcontroller
2.1.1 Using instructions with data memory
2.1.2 ALU instructions involving the General purpose Registers
2.1.3 Instructions affecting the status register
2.2 AVR Microcontroller data format and directives
2.2.1 Data format representation

2.11.5 BCD and ASCII conversion
2.12 Different addressing modes
2.13 Accessing EEPROM in AVR
2.14 Macros
2.14.1 Macros vs Subroutines

MODULE III

3. AVR Programming in C
3.1 Data types and time delays in C
3.2 IO programming in in C
3.3 Logic operations in C
3.4 Data conversion programs in C
3.5 Data serialization in C
3.6 Memory allocation in C
3.7 Programming timers 0, 1, and 2
3.8 AVR interrupts
3.8.1 Programming Timer Interrupts
3.8.2 Programming External hardware interrupts
3.8.3 Interrupt priority in the AVR Microcontroller
3.9 Serial Communication
3.9.1 ATMEGA32 connection to RS232

MODULE IV

4. Study about Interfacing circuits using AVR
4.1 Explain about LCD Interfacing
4.1.1 Implementation in Assembly & C
4.2 Discuss about Keyboard Interfacing
4.3 Understand ADC interfacing using AVR
4.4 Know about DAC interfacing using AVR
4.5 Discuss about Temperature Sensor interfacing.
4.6 Explain about wave generation using 8 bit timers and its programming.
4.7 Explain about PWM mode in 8 bit Timers.
4.8 Study DC motor control using PWM.

CONTENT DETAILS

MODULE I

INTRODUCTION TO AVR MICROCONTROLLER

Need for Microcontroller, comparison with microprocessor, Role of Microcontroller in embedded market, concept of embedded systems, Embedded applications of general purpose Microprocessors, features of AVR family, block diagram of AVR Microcontroller

Comparison of AVR with Microcontroller offered by other manufactures, data memory of the AVR Microcontroller,

IO Memory (SFRs), Internal data SRAM, SRAM vs EEPROM in AVR chips, AVR status register, data RAM memory space allocation in the AVR Microcontroller.

MODULE II

Programming of AVR Microcontroller

General purpose registers of the AVR Microcontroller, Instructions with data memory ALU instructions involving the General purpose Registers, Instructions affecting the status register,AVR Microcontroller data format and directives, AVR Microcontroller Assembly programming, Structure of assembly program, Program Counter and program ROM space in AVR Microcontroller, ROM memory map in the AVR family, Harward architecture in the AVR Microcontroller,Instruction size of the AVR Microcontroller,
RISC architecture in the AVR Microcontroller, Branch Instructions and looping in AVR.
Loop inside a loop, Conditional jumps, Calculation of short branch address,Unconditional branch instructions,Call instructions, Stack and stack pointers in AVR, Access of stacks in AVR, AVR time delay and instruction pipeline,Delay calculation of the AVR, Pipelining Arithmetic, logic instructions and programs,
IO port programming in AVR,IO port pins of AVR,Role of different registers in inputting data, IO Bit manipulation programming, Arithmetic instructions, Different addressing modes,Accessing EEPROM in AVR, Macros, Macros vs Subroutines.

MODULE III

AVR Programming in C:

Data types and time delays in C,I/O programming, Logic operations, Data conversion programs Data serialization, Memory allocation, Programming timers 0, 1, and 2, counter programming, Programming timers in C.

AVR interrupts

Programming Timer Interrupts, Programming External hardware interrupts, Interrupt priority in the AVR Microcontroller, Interrupt priority in AVR,Serial Communication, ATMEGA32 connection to RS232, AVR serial port programming steps.

MODULE IV

INTERFACING:

LCD Interfacing and Implementation in Assembly & C, Keyboard Interfacing, ADC characteristics- ADC programming in the AVR, Sensor interfacing- Temperature Sensor-DAC Interfacing, wave generation using 8 bit Timer, PWM modes in 8 bit Timers, DC motor control using PWM

REFERENCE:-

1. The AVR Microcontroller and Embedded Systems using assembly and C by Muhammad Ali Mazidi, Sarmad Naimi and Sepehr Naimi , Pearson Education.