

**3EC02: MICROCONTROLLER AND APPLICATIONS**  
**CREDITS – 3 (LTP:3,0,0)**

**Course Objective:**

Main objective of this subject is to introduce RISC Architecture in AVR Atmega32 Microcontroller and its features. To enable students to design microcontroller based embedded systems for applications.

**Teaching and Assessment Scheme :**

Teaching Scheme (Hours per Week)			Credits	Assessment Scheme				Total Marks
L	T	P	C	Theory Marks		Practical Marks		100
				ESE	CE	ESE	CE	
3	0	0	3	60	40	00	00	

**Course Content :**

Unit No.	Topics	Teaching Hours
1.	<b>Introduction to Microcontroller :</b> Overview of Digital circuits and microprocessor concepts, microprocessor and Microcontroller differences, Introduction to general Microcontroller architectures, RISC and CISC comparison, RISC features of AVR, Overview of AVR family and features.	03
2.	<b>AVR Architecture :</b> Atmega32 Microcontroller architecture, Registers, status register, Stack Memory, Data memory distribution, Flash memory and program counter, ATmega32 pins & function. Addressing modes of AVR, Editing and Assembling program, Assembler directives, Subroutine and Macros, Intel HEX file.	05
3.	<b>Digital IO Programming and applications :</b> C-programming and Data types, arithmetic and logical operations, delay generation, LED and switch programming, LCD programming; Matrix Keypad programming, 7-Segment Display, Ultrasonic Sensor, PIR Sensor, EEPROM programming, Timer/counter programming, Interrupts.	10
4.	<b>Analog IO Programming and applications :</b> Recall concepts of ADC and DAC, ADC Features, LM35 temperature sensor, LDR light sensor, DAC interfacing and programming.	10
5.	<b>Actuator Interfacing and Programming :</b> PWM concepts, DC motor control using PWM, Relay, Driver circuit, Opto-isolator, Reed Switch, Stepper Motor.	10
6.	<b>Communication Protocols :</b> Serial Port programming, GSM Modem, Bluetooth, SPI protocol, I2C Protocol and RTC interfacing.	07
<b>Total</b>		<b>45</b>

**List of References :**

1. Muhammad Ali Mazidi, Sarmad Naimi and Sepehr Naimi, “ *The AVR Microcontroller and*

- Embedded Systems: Using Assembly and C*”, 1st Edition, Pearson Education, 2012.
2. Dhananjay Gadre. “*Programming and Customizing the AVR Microcontroller*”, 1st Edition, TMH, 2001.
  3. AVR ATmega32 data sheet.

**Course Outcomes (COs):**

1. Relate concepts of Digital circuits and microprocessor with microcontroller and outline AVR features.
2. Understand AVR architecture and concepts assembly programming.
3. Interface and program digital IO devices to use it for user interface.
4. Make use of sensors for monitoring different quantities in application.
5. Design and use driving circuit to interface actuators in applications
6. Integrate Communication protocols for intra and inter system communication.