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|  | | EMBEDDED SYSTEMS | | | |
| DAY/SESSION | **Topic** | | **Description/Syllabus** | **Tasks** | **Kit details** |
| 1 | **General Introduction** | | * Introduction to Embedded Systems-General overview-various domain application of Embedded Systems * General overview –Building blocks of Embedded sytems-Introduction to basic blocks * Quick electrical recap-voltage-current- Resistor –ohms Law |  |  |
| 2 | **Introduction to Controllers and other Peripheral** | | * Sensors-types of Sensors- Basic mechanism-Analog and Digital sensors-ADC-DAC * Actuators- LED-Buzzer-DC Motors and its classification-AC Motor and its classification-Brushless DC motor-Stepper Motor-Servo Motor * Controller and Processor – Atmega 328 controller introduction-reason for selecting Atmega series-Pin diagram Explanation |  |  |
| 3 | **Introduction to Embedded Coding** | | * Introduction to programming-Basics of C programming-if-else if-switch-for-while-do-Setting up the IDE-Explanation to Various modules in IDE-Running a Sample program with IDE |  | * Micro controller * USB cables |
| 4 | **Classification of Inputs and Outputs** | | * Classification of Input and Output-Digital Input-Digital Output-Analog Input – Analog output * Digital Output-various Digital output control-buzzer- Basic Led Control. | * **Task 1** -small basic task with LED and Buzzer will be given to familiarize the Digital Output | * LED Array * Buzzer |
| 5 | **Digital inputs and Sensor Interfacing** | | * Digital input -IR sensor- Introduction -Mechanism-Interfacing with Microcontroller * Ultrasonic Sensor-Introduction-mechanism- Interfacing with Microcontroller | * **Task 2:** Implementing an application using IR sensor | * IR Sensor * Ultrasonic Sensor |
| 6 | **Serial Communication -overview** | | * Introduction to Serial communication -Start bit-data bit-parity-stop bit-baud rate-Serial Communication –RS232- USB | * **Task 3**: Basic task with the serial communication part of the Micro controller | * Micro controller * USB cables |
| 7 | **Analog Input and Analog output** | | * Analog output –controlling the dimming value of LED-Buzzer amplitude control * Analog Input – potentiometer –reading analog values-controlling the Led based on POT-introduction to serial monitor | * **Task 4:** small basic task will be given to familiarize the Analog Input * **Task 5**:small basic task will be given to familiarize the Analog Output | * POT * Buzzer * LED |
| 8 | **Motor Driver** | | * Motor driver- L293d- necessity-purpose-block diagram-controlling motion using driver-controlling speed of the motor * Motion implementation using driver-controlling the motion using input sensors | * **Task6**: Implementing Basic motion using drivers with basic digital sensors | * Motors * L293D motor drivers * Chassis and wheels |
| 9 | **LCD** | | * Introduction to Liquid Crystal Display-functionalities-purpose and requirement-Integration of LCD to the controller | * **Task 7**: Test the various inbuilt function of LCD and implement a distance tracker using ultrasonic sensor. | * LCD * Ultrasonic Sensor |
| 10 | **Relays and Joysticks** | | * Interfacing Joystick to a microcontroller and getting the data from the joystick to control various parameters * Relay working and implementing a basic control circuit using a microcontroller. | * **Task 8:** Controlling AC appliance with microcontroller using relays * **Task 9:** Implementing a joystick controlled Robot | * Relay * Zero Watt lamp with holder * Joysticks * Motors * L293D motor drivers * Chassis and wheels |
| 11 | **Bluetooth** | | * Interfacing Bluetooth to a microcontroller. Exchanging data between the microcontroller and Bluetooth enabled devices say android phone. This will be the basic foundation various Bluetooth controlled applications and wearable’s | * **Task 10:** Building Bluetooth controlled Robot / Bluetooth enabled application | * Bluetooth |
| 12 | **DTMF** | | * Introduction to DTMF module. Interfacing DTMF module to a microcontroller and creating an automated IVR application. | * **Task 11**: Building DTMF controlled Robot / DTMF enabled application | * DTMF Decoder IC * Audio Jack |
| 13 | **RFID** | | * Implementing the RFID tag based application using RFID reader with a microcontroller. | * **Task 12:** Implementing a small application using RFID | * RFID reader * RFID Tags |
| 14 | **Gyroscope & Accelerometer** | | * Working of accelerometer and gyroscope. Interfacing the 6 axis Sensor to a microcontroller and extracting the 6 axis data for each and every point in the real space. This session will be the introductory session for gesture controls. | * **Task 13:** Building Gesture controlled Robot / Gesture enabled application | * Accelerometer * Gyroscope |
| 15 | **GSM** | | * Basic functionalities of GSM. Implementing the basic functionalities of a mobile like triggering a call, receiving a call sending and receiving a message | * **Task 14:** A small demo session using GSM to trigger a call, receive a call send and receive a message | * GSM Module |
| 16 | **I2C Communication Protocol** | | * Detailed overview of I2C communication and implementing a sample communication bus over the I2C protocol using a microcontroller. | * **Task 15:** Implementing a I2C communication protocol between two microcontroller | * Two Sets of microcontroller and USB cables |
| 17 | **SPI communication protocol** | | * Detailed overview of SPI communication and implementing a sample communication bus over the SPI protocol using a microcontroller. | * **Task 16:** Implementing a SPI communication protocol between two microcontroller | * Two Sets of microcontroller and USB cables |
| 18 | **SD card Module** | | * Introduction to SD card module-Interfacing the module to the Controller using protocol SPI –File storage and Access | * **Task 17:** sensor data logger using SD card Module**.** * **Task 18:**Playing the Songs stored in SD card | * SD card Module * Speaker |
| 19 | **IoT-Introduction** | | * Introduction to IoT-Basic architecture – WAMP Server installation – Database creation using My SQL – CRUD operation using My SQL – PHP script creation and execution | * **Task 19:** Basic CRUD operations in database using PHP scripts | * ESP 8266 WiFi Module |
| 20 | **IoT- Client** | | * ESP8266 introduction – Working – Basic networking concepts – AT commands of ESP8266 – Interfacing ESP8266 with microcontroller – Implementing a basic client using ESP8266 | * **Task 20:** Sending sensor data to the Cloud and accessing it via web server | * ESP 8266 WiFi Module * Any analog sensor * Power Supply Adapter |
| 21 | **IoT- Server** | | * Implementing a server using ESP8266 – Receiving commands from client – Controlling the device from remote | * **Task 21:** Creating a web based application to control various devices using microcontroller | * ESP 8266 WiFi Module * Power Supply Adapter |
| 22 | **IoT server and client** | |  | * **Task 22:** Creating an IoT based system – Creation of a Server and a client in a single device using ESP8266 | * ESP 8266 WiFi Module * Power Supply Adapter |
| 23 | **Servo Motor** | | * Servo motor interfacing with micro controller. Implementing application to control the position and speed. This will be base for creating the various arms, legged robots and position controlled applications | * **Task 23:**Position controlled application using Servo. | * Servo Motor * Power Supply Adapter |
| 24 | **Stepper Motor** | | * Stepper motor interfacing with microcontroller. Implementing a position controlled applications. This will be the base for 3D printers and mini CNCs | * **Task 24:** Position controlled application using Stepper. | * stepper Motor * Power Supply Adapter |
| 25&26 | **Final Task** | | * **Task 25:** Implementation normally integration of two sensor with at least one output device(varies from team to team) -1hr * **Task 26**: This task is bit complex than the task 25 building a small system((varies from team to team)(30mins+60 mins) * Doubts Clarification |  |  |