EMBEDDED SYSTEMS & ROBOTICS

(Summer Industrial Training Program-2016)
(SITP'16)

Presented By

...Transforming Engineers to Technocrats

TechieNest

(ISO 9001:2008 Certified Company)
Jaipur Office: CF/O 3&4, Nehru Palace,
Tonk Road, Jaipur (Rajasthan)
Mb: +919251494002

Contact Us

Website: www.techienest.in
e-Mail: query@techienest.in
facebook: www.facebook.com/techienest
Mobile: **+919251094002, +919251494002**

Summer Industrial Training Program (SITP)

EMBEDDED SYSTEMS & ROBOTICS

25+ Technologies
55+ Projects
65+ Practical's

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Course Name:	**Embedded Systems & Robotics**
Certification By:	TechieNest, An ISO 9001:2008 Certified Company
Study Material:	Books & CDs free to each participant
Toolkit:	Shall be provided to each participant in training duration
Practical:	*65+ Practical* to be covered
Projects:	*55+ Projects* to be covered
Training Highlight:	**Simulation + Hardware + Programming + Designing (PCB)**

Mind Control Robot
Voice Control Robot
Internet Control Robot
SPY Robot
SMART RADAR NAVIGATION SYSTEM
Personal Mobile Phone (Design by Your Own)
Multi-Layer Security System
SMART Home Automation System (Voice, Remote, Smart Phones, Internet etc)
RFID based Attendance System using Local Database
Maze Robo, Grid Control Robo, Line Follower Robo, Password access System and Many More....

Fees & Duration:

Fees:	INR 9500/- per candidate	INR 12,500/-
Duration:	30 Days/ 90 Hours	45 Days/ 135 Hours

Embedded Systems & Robotics (Regular Module)		
DAYS	**TOPIC**	**DURATION**
Day 1	*Introduction to ESR* • Definition of Embedded Systems & Robotics • Embedded System Vs. General Computing • Careers in Embedded Systems & Robotics • Why TechieNest for this Training? • Sciences Involved, Terminologies used • Application Areas, Features, Advantages • Industrial Facets, Need & Use • Latest Trends & Upcoming Technologies *Introduction to Technologies* • Brief Introduction to Basic Analog & Digital Electronics • Origin of Integrated Circuits, Advantages • Introduction to Various ICs used in Embedded Systems *Microprocessors & Microcontrollers* • Basic Concept of Processing & Controlling • Computer Architectures • Microcontrollers & their Functional Architectures • Differences between MPU & MCU • Various Microcontrollers & their features • AVR ATMega16 Microcontroller, pin description	3 Hours

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Day 2	**Embedded C Programming** • Fundamentals of Embedded C • The control structures, loops, functions • The General Purpose Input Output Registers • The concept of complier, interpreter & Simulator **Light Emitting Diodes (LEDs)** • Symbol, Working, Types, Functions • Programming MCU to interface an LED **Practical 1:** Glowing LEDs in Simulation **Practical 2:** Simulating AVR to glow an LED using Programming **Practical 3:** Generating Various Patterns on Multiple LEDs (Blinking, Chaser, BCD etc.) **Practical 4:** Generating Diverging & Converging Patterns of LEDs	3 Hours
Day 3	• Introduction and Working of LED Matrix **Practical 5:** Interfacing 8x8 LED Matrix with AVR Microcontroller **Project 1:** Single Character Display on LED Matrix	3 Hours
Day 4	**Seven Segment Displays (SSDs)** • Need, features & working concept • Types of SSDs • Interfacing of SSD with Microcontroller • Multiplexing of SSDs to display multiple digits **Practical 6:** Interfacing single SSD to display single digit counters **Practical 7:** Multiplexing multiple SSDs using Hardware Optimization Concet **Project 2:** Traffic Light Controlling Prototype **Project 3:** Digital Clock Display	3 Hours
Day 5	**DC Motors** • The basic concept of motors (Torque, RPM, etc.) • Types (brushless, geared, etc.) • Working Methodology of various motors (DC motor, stepper motor, servo motors etc.) • Motor Drivers: Need, features, Driver ICs **Practical 8:** Controlling a simple DC motor rotation (CW, CCW) using MCU. **Practical 9:** 8 direction movement of a two motor based robotic vehicle system. **Project 4:** Timer Based Automatic Door Opening & Closing	3 Hours

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Day 6	**Sensors**	3 Hours
	• Significance, and Need of Sensors • Differences between Sensor, Actuators and Transducers • Types of Sensors (Analog and Digital) & their Working • Infra-Red rays (applications & range), Line-of-Sight (LOS) Communication • Infra-Red Sensor: Circuitry & Working • Working & Circuitry of a Light Dependent Resistor (LDR) • Taking Input from sensor to microcontroller *Practical 10:* Interfacing LDR with MCU as light controlled switch *Practical 11:* Interfacing IR Sensor as a touch less switch with AVR *Project 5:* Sun light based Street Light Controlling Prototype *Project 6:* Obstacle Detector Robot	
Day 7	*Practical 12:* IR sensor as a binary color sensor *Project 7:* Black/White line follower Robot *Project 8:* Edge Follower (Never Falling Robot)	3 Hours
Day 8	*Project 9:* Light Searching Robot *Project 10:* Grid Counter Bot	3 Hours
Day 9	**Liquid Crystal Display (LCD)** • Origin of Displays, historical background • Various Techniques used for Displays • Why LCD? • Types of LCD used in Embedded Systems, • Working methodology & Pin Description of 16x2 LCD • Registers & Memory Space in LCD • Modes of Operations • LCD Commands • Creating Functions for various operations to use LCD with microcontroller *Practical 13:* Printing a Single Character using Microcontroller on LCD	3 Hours
Day 10	*Practical 14:* Displaying a String on LCD using AVR *Practical 15:* Showing a Numeric Value (or Variable) on LCD *Practical 16:* Rotating Single Characters/string on LCD *Practical 17:* Sand-watch display of String or character on LCD *Project 11:* Digital Stop Watch • Concept of Memory Mapping • Creating user defined character library in the LCD memory • Creating Function for a new character generation in LCD *Practical 18:* Printing a User Defined character on LCD *Project 12:* Creating a Custom Animation/Game of your choice	3 Hours

Day 11	**Relays** • Definition, Working Methodology, • Types, Advantages & Application Areas • Important Specifications • Switching/Controlling of DC Relay using Microcontrollers (Transistorized Switches) • The Darlington Pair; Inductor Driver ICs (ULN2003/ULN2803) **Practical 19:** Interfacing AVR with a Transistor **Practical 20:** Interfacing of relay with microcontroller (MCU) **Project 13:** Seminar/Conference Hall Automation	3 Hours
Day 12	**Keys/Switches** • Types, Working & Uses • The Pull-Up Concept • Interfacing single switch with Microcontroller • Interfacing Multiple linear Keys with MCU **Practical 21:** Taking Input from single Key to MCU to ON/OFF led **Practical 22:** Taking Input from multiple Keys to MCU to control SSD **Project 14:** Curtain Opener **Project 15:** Manually Controlled Smart Shopping Vehicle for Mall/Store Management.	3 Hours
Day 13	**Keypad Matrix** • Concept of Keypad matrix • Taking input from 4x3 Keypad Matrix **Practical 23:** Interfacing Mobile Keypad Matrix and displaying results (numbers) on LCD **Project 16:** Password Controlled Security Systems for Restricted Areas **Project 17:** Basic Calculator using Keypad Matrix and LCD	3 Hours
Day 14	**Analog to Digital Converters (ADC)** • Definition & Need of ADCs • Circuitries used for Analog to Digital Conversion • Inbuilt ADC in AVR Microcontrollers • Available channels, Size & Various Registers used • Creating function to take an analog input on AVR and converting it into Digital for further Processing **Analog Sensors** • Real World Information Interfacing with Microcontrollers • Interfacing analog IR sensors **Practical 24:** Displaying analog value of IR Sensor on LCD **Practical 25:** Making a digital scaling system for small distance measurement **Project 18:** Color Matching Machine	3 Hours

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Day 15	**Query Solving Session & Training Presentation**	**3 Hours**
Day 16	*Sensors continued...* • Temperature Sensor: Concept, Scaling Factor & interfacing with AVR • Gas Sensor (LPG/Smoke) *Practical 26:* Interfacing Temperature Sensor with AVR MCU *Project 19:* Digital Thermometer *Practical 27:* Interfacing LPG Gas Sensor with AVR MCU *Project 20:* Automatic Gas Leakage Detector & Alarming System	3 Hours
Day 17	*Project 21:* Temperature Sensor based Alerting/Alarming System for process controlling & monitoring *Project 22:* Microcontroller based Smart Home for improved Energy Efficiency & Security Aspects *Ultrasonic Sensor* • Concept, Capabilities & limitations. • Applications. *Practical 28:* Interfacing Ultrasonic Sensor with AVR *Project 25:* Distance measurement of an object using ultrasonic sensor. *Project 26:* Smart Radar navigation system	3 Hours
Day 18	*Touch Sensors/Screens* • History & Origin of Touch Screens • Different Types of Touch Screens • Resistive Touch Screens: Working Principle • Calculation of Touch Co-ordinates over Touch Screen • Taking input from a Touch Screen to AVR MCU *Practical 29:* Interfacing Resistive Touch Screens with AVR *Project 26:* Touch Screen Based Pattern Locking Enabled Locker	3 Hours
Day 19	*Accelerometers* • The MEMS Technology • Gyroscopic Sensors or Accelerometers • Taking input of 3-Dimensional Motion Information into Microcontroller *Practical 30:* Interfacing an MEMS based Accelerometer with AVR *Project 27:* HMI(Human Machine Interface) Controlled Wheel Chair	3 Hours
Day 20	*Frequency Synthesizing Techniques(DTMF)* • Tele Switching Concepts • Concept of Dual Tone Multiple Frequencies • DTMF Encoding & Decoding Process *Practical 31:* Interfacing DTMF module with AVR to control LEDs *Project 28:* Mobile Controlled Wireless Robotic Vehicle *Project 29:* Cellphone operated Water Irrigation Pump Controlling	3 Hours

Day 21	**Communication Systems(RF communication)** • Definition, Types • Wireless Communications: Available Frequency Spectrum • Radio Frequency Wave Spectrum & Its Applications • Transmission & Reception Methodology of Parallel bits of Data using RF • Phenomenon of Encoding & Decoding the information **Practical 32:** Transmission & Reception of Data using RF from one end to other **Project 30:** Wireless keypad controlled Robotic Vehicle **Project 31:** Portable Touch Screen Remote for Office Automation	3 Hours
Day 22	**Communication Protocols** • Various Communication Protocols • RS232 Protocol; Baud Rate and Bit Rate • The concept of Serial/Parallel Synchronous/Asynchronous communication to send data bits • Inbuilt Universal Synchronous/Asynchronous Receiver/ Transmitter in AVR • USART registers & their working • Creating functions to Establish Serial Communication of PC with Microcontroller using communication ports **Practical 33:** Sending/ Receiving Data from/to PC to/from Microcontroller & Displaying it on LCD **Practical 34:** Controlling Microcontroller Operations using PC **Project 32:** PC Controlled security system	3 Hours
Day 23	**Bluetooth** • Definition, Concept • Working Range, Application Area **Practical 35:** Interfacing Bluetooth with microcontroller & Controlling Microcontroller Operations **Project 33:** PC Controlled Wireless Smart Food Serving Robot **Project 34:** Android Smartphone Bluetooth Controlled Modern Home Automation System **Voice Processing** • The Concept of Voice processing **Project 35:** Voice Control Robot **Project 36:** Voice control Smart Automation	3 Hours

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Day 24	**RFID** • The Concept of RFID card & its reader • Tag based security analysis *Practical 36:* Interfacing RFID Reader with ATMega16 *Practical 37:* Switching Electrical Appliances using RFID card *Project 37:* RFID based Attendance System **Project 38:** Smart Card Based Security System	3 Hours
Day 25	**Global Services for Mobile (GSM)** • Introduction to mobile communication • Introduction to GSM terminology • GSM Frequency bands • GSM/CDMA • Importance of SIM, Scope and Advantages of GSM • GSM AT Commands *Practical 38:* GSM Network testing in GSM Modem *Practical 39:* GSM AT Commands testing for reading SMS, dial a number *Practical 40:* GSM call answering / halt *Practical 41:* Sending SMS from GSM modem to another mobile	3 Hours
Day 26	**Techie AUTOMATE** *Project 39:* SMS controlled Irrigation water controller system *Project 40:* SMS based Modern HOME AUTOMATION *Project 41:* Acknowledgement for Security Systems	3 Hours
Day 27	**TV Remote** • Introduction to TV remote • Interfacing TV remote with AVR MCU *Practical 42:* Checking Remote Keys on Serial Port; *Project 42:* TV Remote control smart Home appliance. **PCB Designing** • Process, Resources & Outline • Layout Designing Software *Practical 43:* Placing & connecting objects; creating pads in software for PCB Layout designing	3 Hours

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Day 28	***Layout Designing*** • Introduction, Key Aspects, Rules & Techniques • My First Printed Circuit Board Design ***Practical 44:*** Creating a +5v DC power supply PCB layout • Masking, Etching • Drilling ***Practical 45:*** Taking Mask Printouts for Etching; Etching using Etchant solutions ***Practical 46:*** Drilling the Copper Plate	3 Hours
Day 29	***Practical 47:*** Component Mounting, Testing & Verification ***Project 43:*** Development of Personal Learning Board	3 Hours
Day 30	Query Solving Session Training Presentation	No Limits
Day 31	***Timers/Counters*** • Definition of Timer and Counter • Uses, Types • AVR inbuilt Timer/Counter Circuitries • Registers, Functions, Various mode of Operation • Controlling the amplitude of Voltage or Current • Generation of multiple frequencies • Pulse Width Modulation (PWM) using Timer ***Practical 48:*** Variation in the intensity of LED ***Practical 49:*** Generating Multiple Frequencies ***Practical 50:*** Speed control of DC motor using Timer/Counter ***Project 44:*** Virtual Touch Piano	3 Hours
Day 32	***Internet*** • Networks (LAN, WAN, MAN) • *Telnet:* Concept, working, Commands • Windows Remote Desktop Application • Accessing Server from Client Systems using Internet ***Practical 51:*** Designing a Local Network ***Project 45:*** SPY Robot using Internet ***Project 46:*** Internet Enabled Home Automation System	3 Hours

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Day 33	**EEPROM** • Concept of RAM, ROM and Flash Memory • Arrays, Structures, ASCII Data accessing • Use of Various Other Libraries (math.h, string.h etc.) • Memory data storage • Internal EEPROM in ATMEGA16 *Practical 51:* Writing a character to EEPROM *Practical 52:* Reading a character from EEPROM and displaying it on LCD *Practical 53:* Storing text to EEPROM *Project47:* Storing/Retrieving Security passwords to EEPROM *Project 48:* Non Volatile Embedded System Database	3 Hours
Day 34	**Controlled Area Network** • Communication in between more than one microcontroller • Network Topologies • Medium, Range, protocol, speed and modes of communication • SPI (Serial Peripheral Interface) *Practical 54:* Controlling operations to a target microcontroller device *Practical 55:* Sending Feedback on completing reception *Practical 56:* Interfacing Bluetooth with microcontroller & Controlling Microcontroller Operations *Project 49:* Exchanging of Text data between multiple microcontrollers	3 Hours
Day 35	**GSM Mobile** *Project 50:* Development of Mobile Phone	3 Hours
Day 36	***Mobile Phone Development Continued…***	3 Hours
Day 37	**Global Positioning System (GPS)** • Introduction to GPS • Satellites and its orbits • Range, Accuracy and Tracking • Longitude and Latitude *Practical 57:* GPS network testing in GPS module *Practical 58:* Displaying GPS location coordinates	3 Hours
Day 38	**Techie Chase (Project based on GPS & GSM)** *Project 51:* School Kids Security System Based on GPS *Project 52:* Live Vehicle tracking System	3 Hours

Day	Topic	Duration
Day 39	**Brain Wave** • EEG (Electroencephalography) • Brainwaves & its types. • Sensor to record Brainwaves *Practical 59:* Interfacing of BW Module with Microcontroller *Project 53:* Mind Control Robot.	3 Hours
Day 40	**Arduino** • Introduction to Arduino Fundamentals • What is open source platform • Introduction to software used • Software installation • The General Purpose Input Output Registers • The concept of complier, interpreter & Simulator *Practical 60:* Glowing Single LEDs in Arduino. *Practical 61:* Generating different patterns on LED.	3 Hours
Day41	**Arduino Interfacing** • Concept , working of LCD, PWM, Servo Motor • Interfacing LCD, PWM, Servo Motor with Arduino • Fundamentals & Concept • PWM using Arduino *Practical 62:* Displaying Character, String On LCD. *Practical 63:* Displaying Number on LCD. *Practical 64:* Controlling Brightness of LED *Practical 65:* Controlling Speed of DC Motor	3 Hours
Day 42	**Project 54:** Designing Soil Moisture Sensor using Arduino. **Project 55:** Capacitive Touch Screen Switch	3 Hours
Day 43	***Personal Project Allotment to Student*** ***And*** ***Working continue*** ***Project work Done by Students***	3 Hours
Day 44	***Presentation and Demonstration of project***	3 Hours
Day 45	***Presentation and Demonstration of project*** ***Certificate Distribution***	3 Hours

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Benefits of the Training

- According to recently released NASSCOM report, the total addressable embedded system R&D global opportunity is expected to reach approx. $89 billion by 2015 where India alone could contribute approx. $15 billion in size.
- Expansion plans by MNCs and NASSCOM suggest embedded systems to be the next sunrise sector.
- With the technological advancement more and more professionals from the fields of robotics and embedded systems are required.
- This training facilitates the practical learning process and also exposes students to a hands-on work environment.
- It is ideal for students wanting to participate in robotics competitions, make robotics projects, and those who want to put their theory to practice.

Why TechieNest for Embedded Systems & Robotics Training?

- Vast experience of having Big Outreach Workshop experience with over 200 colleges in all over India including IIT Delhi, IIT Hyderabad, IIT Patna, NIT Raipur, NIT Patna, Bits Goa, Bits Pilani and many more.
- Trained more than 20,000 students in the field of EMBEDDED SYSTEMS & ROBOTICS, MATLAB (Image Processing & GUI), and VLSI & VHDL.
- We organize national level competitions for Robotics.
- TechieNest has Research Engineers having excellent research aptitude, teaching pedagogy who illustrates their finding through practical demos during workshop/training.
- Manufacturer of own products and delivers all across the country.
- Techie-Shop: One stop solution for all embedded and robotics quality products.
- Offering Project Based Training, Projects on Demand, corporate projects, commercial projects, and consultancy in Engineering Projects.
- TechieNest is associated with IIHT in Jaipur, CYBERAEGIS in Hyderabad.
- Joint Venture of TechieNest with Nanosemi Technology as in Auto-Botics.
- International Association of TechieNest with Semiconductor Technologies, Singapore.
- Training Centres located in Jaipur, Noida, Hyderabad, Raipur, Vizag, Kota and more.
- Dedicated 24x7 R&D lab and digital library for students.
- Trained over 50+ international students in TechieNest Technology Transfer Program 2014-15.

Features of Training:

- Training certificate will be awarded on the basis of Project.
- Trainer: Student ratio is 1:20
- The training is based on Practical Approach only.
- A Training Kit will be provided to each trainee in the training duration.
- Study material, CDs & software will be provided.
- Limited seats in a batch on first-come first-serve basis.

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Pre-Requisites:

1. Basic Knowledge of C programming
2. Basics of Electronic Terminology
3. Eagerness to learn new technologies

Who can attend this Training?

- Students from B.E/B.Tech/M.Tech/Diploma (ECE/EEE/CSE/IT/MECH or so) can join this.
- Electronic Hobbyists and anyone having interest in the field with prerequisites.

To get enrolled, you may visit: www.techienest.in/SITP

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