November 15

2015

Course Title: ROBOTICS

This Robotics course will teach you embedded c programming, hardware interfacing with different sensors, actuators and short and long range wireless links and much more. It assumes that you have some basic analog and digital electronics knowledge. You won't need to buy any expensive software for this course. All hardware will be brought by us to demonstrate practical application.

By: Rana Muhammad Waqar

Contents

Robotics

This course provides an overview of robot mechanisms, dynamics, intelligent controls and monitoring.

Objectives

After this course student will know:

How to collaborate in groups and teams

How to design robots for specific activities and scenarios

How to use arduino ,proteus ,processing and visual c # software

BLDCs,servos,stepper,accelerometer,temperature sensor, etc.

To design, develop and complete robotic activities and challenges

Course Content

Session1: Getting started with digital world

1. Course Introduction
2. Course software
3. Arduino software
4. Arduino programming
5. Digital input / output programs
6. Simulation on Proteus

Session 2: Analog world interface

1. Analog to digital conversion concept
2. Arduino ADC handling
3. Temperature and accelerometer interface
4. Raw data to information conversion of sensors
5. Simulation on Proteus
6. Hardware demonstration

Session 3: LCD and serial port interface with data display

1. UART interface basics
2. UART data sending programming
3. UART data receiving programming
4. Data display of UART on virtual terminal
5. Hardware demonstration
6. Liquid Crystal Display interface
7. LCD programming
8. Temperature sensors data display on LCD

Session 4: Actuators

1. DC motor interface using H-bridge
2. Different H-bridge designs
3. PWM (Pulse width modulation)
4. Speed control using PWM
5. Controlling DC motor direction and speed using UART
6. Servo motor basics
7. Programming multiple servos
8. Robotic arm on servos

Session 5: Wireless links (Short range)

1. Bluetooth interface with programming
2. Data telemetry and actuators controlling over Bluetooth
3. Short range RF modules (transceivers) interface
4. Data telemetry over RF using command set
5. Actuators controlling over RF using command set

Session 6: Wireless links (long range) and GPS

1. GSM module interface
2. Sending data over SMS using AT command set
3. Receiving data over SMS on interrupt
4. GPS basics and interface
5. Extracting data from NMEA sentences
6. Extracting latitude, longitude, HDOP and no. of satellites
7. Tracking device design using GSM , GPS

Session 7: Bluetooth controlled and line following ROBOT

1. Designing of complete Bluetooth controlled robot
2. Hardware demonstration
3. Designing of complete line following robot
4. Hardware demonstration

Session 8: Wall following and IR controlled ROBOT

1. Distance sensors basics
2. Design of complete wall following robot
3. Detecting obstacles
4. IR receiver interface and programming
5. Design of complete IR controlled robot

Session 9: Controlling and monitoring hardware using GUI

1. Designing GUI on Visual C #
2. Serial port interface using Visual C #
3. Data display using Visual C #
4. Controlling Servo motors using Visual C #
6. Designing detailed GUI to control multiple actuators
7. Designing detailed GUI to monitor multiple sensors

Session 10: Interfacing processing software with hardware

1. Processing software basics
2. Designing and controlling shapes on processing
3. Serial port interface in processing
4. Controlling Cube motion using accelerometer

Session 11: Controlling robot using voice and generating voice using text

1. Voice recognition module basics
2. Processing interface with voice recognition module
3. Controlling graphics using voice
4. Voice recognition module interface with Arduino
5. Controlling robot using voice
6. Generating voice using text

Session 12: RFID and fingerprint based security

1. Fingerprint scanner basics
2. Interfacing fingerprint scanner
3. Security system using fingerprint scanner
4. RFID + fingerprint based security
5. Data entry using RFID + fingerprint

Session 13: Kinect interface

1. Kinect basics
2. Kinect interface with Processing
3. Using RGB,IR and depth sensor of Kinect
4. Controlling ROBOT using hand gesture

Session 14: Object following

1. Object following using distance sensors
2. Object following using MATLAB

Session 15: Quadcopter designs

1. Quadcopter basics
2. System components (ESCs,lipos,controller)
3. APM 2.6 basics

Session 16: Quadcopter controller and ground station

1. Mission planner basics
2. Setting quadcopter parameters
3. Auto flight planning
4. Flying basics
5. Discussion of all topics

Duration of course / training

No. of sessions: 16
Duration of each session: 2 hrs.
Total No. of contacting hours: 16 x 2 = **32hrs**.

No. of classes / week

No. of Session per week: **2 sessions**

Start Date& Time (Tentative)

Commencing from: **Monday, November 15, 2015**
Time: **05:00 PM to 07:00 PM**

Prerequisites for course /training

Familiarity with basic analog and digital electronics

Target Audience

At least BS, BE, B.Sc and all bachelors programs of all relevant technologies. Hobbyist with some basic digital and analog electronics knowledge may also join.

Suggested course / training fee

For UIT students: PKR 12,000/-
For Other students: PKR 14,000/-
For Professionals: PKR 16,000/-

Resume / Profile of trainer / Teacher

Mr. Rana Muhammad Waqar has done Bachelor of Science (B.S.), Electronics from Sir Syed University of Engineering and Technology. He is related to the field of aerial vehicles design and has designed commercial grade low and heavy payload quad copter, hexacopter and octacopter.He has been:

- Winner of MIC(Microcontroller Interfacing challenge) PROCOM 2010
- Selected for Techfest IIT Bombay 2012,after winning national leg in Pakistan
- Best engineering design award NERC 2013
- Winner of ROBOWAR PROCOM 2012
- President of ROBOCOM 2013 SSUET
- Organizing committee member of YOUTH SCI FUN 2014
- Winner of line following robot PROCOM 2012,2013
- Gold medal for securing 3rd position in all faculties in D.A.E

Pastime projects of trainer:

- Autonomous box picking robot with color detection and using line following
- Autonomous maze solving robot using wall sensing and obstacle sensing
- Person following robot with speaking ability to convey stored messages
- GSM based medical sensors monitoring system
- GSM based security system
- RF link based short range telemetry and Telecomm and system
- GUI based monitoring and control system
- Controlling of 5 DOF robotic arm using GUI
- Wrist motion control robot using MEMs based accelerometer
- Reading and simulating 9 DOF MEMs based IMU
- Quad copter
- PID based RPM control board of BLDC motor
- Servo motor based spider robot
- RFID based attendance
- And many other small electronics cards