

# Arduino

## Chapter 1.

Getting started with Arduino.

- Introduction to Arduino.
- Setup your computer to use Arduino.
- Understanding electronics elements – Resistors, capacitors, transistors, relays etc.

## Chapter 2.

LEDs.

- Blinking of LEDs.
- Fading of LED.
- Circling of LEDs. ( FOR loop)
- Blinking of EVEN and ODD states of LEDs.
- LED dice.
- Traffic light system. And many more projects

## Chapter 3.

Serial monitoring.

- Controlling of LEDs from your computer.
- Reading analog and digital inputs.

## Chapter 4.

Digital inputs.

- Controlling LED using push button.
- Switching ON a relay.

## Chapter 5.

Analog inputs.

- Controlling of LEDs using a joystick.
- Controlling a DC motor, PWM.
- Changing the brightness of LEDs using potentiometers.

## Chapter 6.

LCD displays.

- Wiring of LCD screen with Arduino.
- Displaying a message in LCD screen.
- Screen navigation on LCD.
- Turn ON a LED by entering the password.
- Knowing the status of the LED.
- Scrolling of text.
- Displaying room temperature using LM 35 temperature sensor.

### **Chapter 7.**

Seven segment display.

- Simple automatic countdown and count up. (FOR loop)
- Increment or decrement a number by using push button.

### **Chapter 8.**

Servo motors.

- Controlling Servo Motor with Joystick
- Indexing of Servo motor
- Direction control of Servo Motor
- Servo Motor based Projects
- Synchronizing 2 Servo Motors

# Assignments:

Sample Project Ideas

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## Navigation

- Easy
  - Intermediate
  - Advanced
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# Easy

- Frequency Counter using 16x2 LCD
- Dancing Ghostbusters Toaster - Turn your toaster into a dancing toaster -- Slime not required.
- The SAM 15x15 is an Arduino development board of just 15 x 15mm with the powerful controller SAMD21G18. It has even more I/O pins than the Arduino Zero: 34 instead of 20.
- The Thirsty flamingo beeps whenever humidity levels in the soil drop. Full tutorial including electronic diagram, code and 3D modeling file.
- Build a Simple Arduino-Based Calculator
- Smart Night Lamp for Kids: Lights up when dark and changes color automatically.
- Motion Following Camera Base: Upgrade your home security camera, webcam, or any other type with a motorized stand that will detect, track, and follow any motion in the room!
- Lightning Detector for Arduino: A simple lightning detector for Arduino.
- RedBot Buggy UI: Learn to build an Arduino program that does things when it receives serial commands. Send commands to drive a SparkFun RedBot buggy around from your computer.
- A simple PID fan controller with nice LCD display: The fan controller described on this project page, controls one or more PWM controlled 12V PC fans. It uses the input from two precise DHT22 based temperature sensors. The MCU is an Arduino Uno, which is powered using a 12V power source. On top of the Arduino Uno, there is the Adafruit data logger shield – and on top of that is an Adafruit LCD shield. The software is a simple, custom written PID controller.
- Electronic Piano Keyboard with Preset Songs: An electronic keyboard with 7 piano keys, programmed to Middle B/A/G/F/E/D/C, and an 8th button used to access a menu of preset songs using a 16x2 LCD screen.
- ArduPhotographer: Why do not let Arduino to automatically trigger your SLR based on motion detection or just remotely via web interface?
- Smartphone controlled Dice Roller. Why not just press a button on your smartphone! Get an Annikken Andee, some servo, connect some wires and finally code in Arduino for a simple graphic user interface and have fun guessing the next number on the dice!
- Create a simple data logger, recording humidity and temperature over time. Check if your documents are safe in your root cellar.
- Learn how to create Dragonkeepers' Screensaver.
- Smart phone Garage Door Opener.
- Learn how to build a Talking Clock.
- LED Stoptlights
- Display LCD
- Intrusion alarm.
- ultrasonic range finder: distance measurement with 2.4 ftf and ultrasonic sensor, see example.
- A simple 2-person pong game for Arduino Uno

- Morse Keyer: A simple Morse keyer for kids.
  - Morse code decoder: A simple Morse code decoder using Serial monitor and push button switch
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## Intermediate

- Python projects for Arduino DUE (and other 32 bit MCUs)
- LED Lightsaber - 4 part series detailing how to make a very cool lightsaber!
- Make your guitar an IoT device with temperature and humidity sensor. Combining guitars, Arduino, RaspberryPi, Azure and mobile apps.
- Hack your air conditioner and control room temperature with an Arduino
- NexArdu: Illumination Smart Control (based on Nexa devices)
- Machine olfaction: Electronic nose with Taguchi gas sensors.
- General purpose GPIO and relay board for an Arduino Nano.
- Sonic eye for the blind to help them to navigate with no-cane (less use)-- At the minimum, they are informed of the setting of environment beyond the reach of the cane.
- Build a Talking Clock with an LED display, temperature sensor and light sensor. Contains a good video introduction to Arduino and a tutorial with a components list.
- Write a library
- Become a master brewer with your own malt kiln
- Blinkenlight Experiments Implement lots of different experiments with just 20 LEDs. Lots of ideas for just a bunch of LEDs. Difficulty ranges from novice to advanced. Figure out more applications for this setup.
- Stopwatch
- Balance multirotor motor using Arduino & accelerometer
- Custom Arduino Controller with character LCD display and wireless serial communication facility
- Steampunk chromatic clock-Digits based on colors. Time, Date and Temperature-Humidity
- Email notifier
- Arduino Ipod like-SMARTGPU2
- Light organ (psychedelic lights) using FFT library with power stage TRIAC controlled
- Make a speedometer for your vehicle using a hall effect sensor and a magnet
- LED Matrix Control
- MIDI Controller

- Drawing Bot
- TETRIS Game-mini SMARTGPU
- Maze Solver Robot
- Anti-tailgater: use distance and speed sensors to light up a sign in the back window of a car.
- Auto-internals: read OBDII data from your car and display the state of the sensors, calculate MPG
- Ultimate computer case fan controller: you got 6 analog inputs and 6 PWM outputs. That's a lot of fan control!
- Fountain and/or lights that respond "happy to see you" via proximity and/or motion sensors.
- Ham radio Morse code keyer/propagation beacon.
- Ham Radio Transceiver
- Arduino VFO - a Direct Digital Synthesis Radio-Frequency generator on the Arduino platform
- Arduino VFO (2) - an old-school Colpitts Radio-Frequency Oscillator under Arduino control
- Arduino VFO (3) - a full-featured Radio Frequency Oscillator using the new Kanga-UK DDS Shield
- A small ball of individually addressable LEDs.
- Fail Safe lock using keypad, LCD, electric deadbolt with optional proximity sensor.
- Colour following robots: Two or more robots that follow lines of a certain colour, so one follows blue the other follows Red etc.
- kitchen timer:use in kitchen
- Home Wireless Internet Thermostat:Controllable from anywhere from an iPhone via 802.11 connectivity.
- Radon Gas Detector: Interface Safety Siren Radon detector
- Web server that can turn on and off outputs via a web form
- Seismograph- Hang a pendulum. Put an LED on the bottom. Put a small "webcam" under that, looking up. (Choosing the right "camera" critical to success) Monitor and record which pixel in image is brightest. Hardest: Achieving high enough data capture rate.
- Arduino + vineyard = Vinduino. Soil moisture measurement
- Make a home security system with sensors for intrusion detection and a GSM shield for notification. The project can be expanded using RFID reader, thermal printer, 433 Mhz modules, internet connectivity etc.
- Make a self-recharging UPS sytem which recharges itself when plugged into a power source and runs on the recharged battery(s) when the power source fails. This could be very handy for your projects.

- Internet controlled car (Arduino + GSM Shield + Motor Shield)
  - Convert Color to Sound: Use A.C.I.D. (Arduino + TCS3200 color-to-frequency converter) to hear all the colors of the rainbow, or hook into the SPI header to feed color detection results to other components.
  - Christmas Tree Shield with Addressable LEDs WS2812/WS2812b and "Jingle Bells" melody
  - wireless pan and tilt camera rig powered by Arduino nano and NRF24L01 wireless Transceivers.
  - Intrusion Detection Alarm - Detects When Someone OTHER Than I Enter And Speaks Scary Warning with Music!!
  - Line follower robot
  - Obstacle avoider robot
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## Advanced

- Arduino Retro Handheld Gaming Device.
- Arduino Retro Computer TV- How to build a computer using 2 Arduinos, an SD card reader, a TV, and a PS2 keyboard. This computer can execute BASIC programs. This is like a C64 or Sinclair.
- Arduino Home Automation System
- Modify open source projects done with other micro-controllers like PIC, AVR, Basic stamp, PICAXE etc. to work with Arduino
- Arduino theremin using ultrasonic sensor or capacitive plates
- Synthesiser
- Arduino Radio - a Software-Defined-Radio receiver on the Arduino Due
- Motion Tracking Turret
- Arduino SmartPhone Demo-SMARTGPU2
- Bluetooth Controlled Car over Android
- Bluetooth remote controlled Arduino with WLAN web cam so you can create an awesome remote controlled car
- Using an Android phones Gyro to Control an RC Car over Bluetooth
- Hands-free mobile display to message other drivers, i.e., "Back Off!".
- Wifi controlled RC-Car
- Remote controlled desktop missile launcher

How about a wireless RC car in a friend's living room in say Germany, operated by a girl in New York (or San Francisco). Should be simple: girl uses keyboard to transmit instructions through German friend's computer. German Friend has a wireless transceiver that

communicates to the RC car. How does she know what instructions to send? Easy way is Skype. Creative way are sensors, even cameras on RC car that communicates back to her in NYC!