

# Newton's Apple

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NEWTON'S APPLE IS BACK THIS WEEK WITH ANOTHER EDITION THAT COMPILES CREATIVITY FROM ALL CORNERS OF ECE . THE PLACEMENT SEASON ALONG WITH INTERNALS FOR 3<sup>RD</sup> AND 4<sup>TH</sup> YEAR STUDENTS SHOWED THEIR EFFECT ON THE PROGRESS OF THIS EDITION. NEVERTHELESS, WE HAVE COMPILED A FEW INTERSTING ARTICLES FOR YOU GUYS TO MAKE FOR AN INTERSTING READ.

## HAVE YOU HEARD OF ARDUINO?

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Arduino. Chances are that you've heard this name before or maybe if you have an interest in electronics you even own one. But if you have no idea what Arduino is or if it's the first time you've stumbled across this name then read on! This article is especially for you!

Well, it all began in 2005 when a group of Italian researchers were trying to figure out a way to teach electronics to students within a short span of time. They decided that this device will have all the basics of a microcontroller. A processor, a memory, input and output pins and also a power supply but they wanted this to be faster than a microcontroller, easier to use and understand and also cost less. This is how the Arduino family took birth with the first prototype being released in 2005. As of today, atleast 3,00,000 Arduino Boards have been sold worldwide by AdaFruit (the company that makes them)

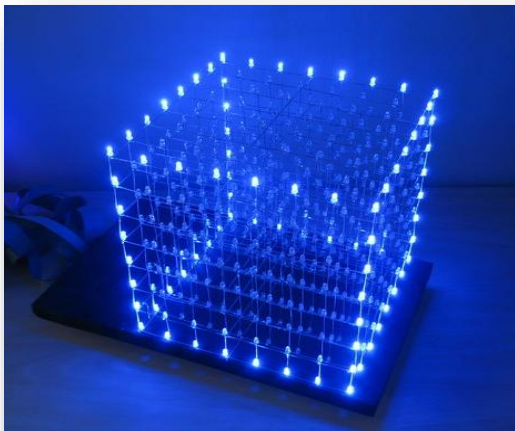
This is what a basic Arduino board looks like



## WHAT CAN YOU DO WITH IT?

To be honest there are at least ten thousand different things which Arduino is capable of doing. From blinking LEDs to designing Automated Robots, with the right programming, an Arduino can do anything you want it to. The sky is your limit. All thanks to the huge variety of sensors it has onboard a wide range of applications are made possible with the Arduino. From temperature controlled circuits to circuits that react to gestures, anything is possible.

### What makes Arduino so popular?



Like this 8x8x8 LED Cube.



Or this toy car that can see!

As stated earlier Arduino has a processor, a memory and all the other things a basic low-level computer has. In addition to all this, it has a set of input/output pins and a USB port. The reason for Arduino's popularity is due to the fact that unlike microcontrollers which work on assembly level and BASIC like languages they can be programmed with languages like C, C++ and JAVA. Unarguably, the three most well-known programming languages in the world today.

The IDE required for programming Arduino is based on the *Processing* and *Wiring* projects developed at MIT. These are open-source projects which means that anybody can contribute to them and they are free to download. And also, they are very easy to understand. Programming in Arduino can give you a rough idea of how Embedded technology works and also introduce you to a little bit of Robotics. But ultimately, it is the ease with which anyone can learn to use it which makes Arduino so popular.

### How long will it take for me to learn how to use an Arduino?

The answer depends on how much of programming you know and how good your basics of electronics are. If you are good enough with C/C++ and basic elements of programming like loops,

conditional statements (if, if-else etc) and a few basic syntax rules then programming an Arduino will be a breeze. However, one also needs to have good basics in electronic as often Arduino will have to be connected to other devices. Like motors, sensors, light-bulbs etc and this ‘how to connect’ part requires you to know a few basics of electrical circuits and properties of elements like transistors, driver-ICs etc. But don’t worry, with the right amount of interest you can start blinking LEDs from day-1. There are many tutorials on Youtube which teach you everything about the Arduino.

Btw, this is how an LED blinking program looks like

```
#define LED_PIN 13

void setup() {
  pinMode(LED_PIN, OUTPUT);    // Enable pin 13 for digital output
}

void loop() {
  digitalWrite(LED_PIN, HIGH); // Turn on the LED
  delay(1000);                 // Wait one second (1000 milliseconds)
  digitalWrite(LED_PIN, LOW);  // Turn off the LED
  delay(1000);                 // Wait one second
}
```

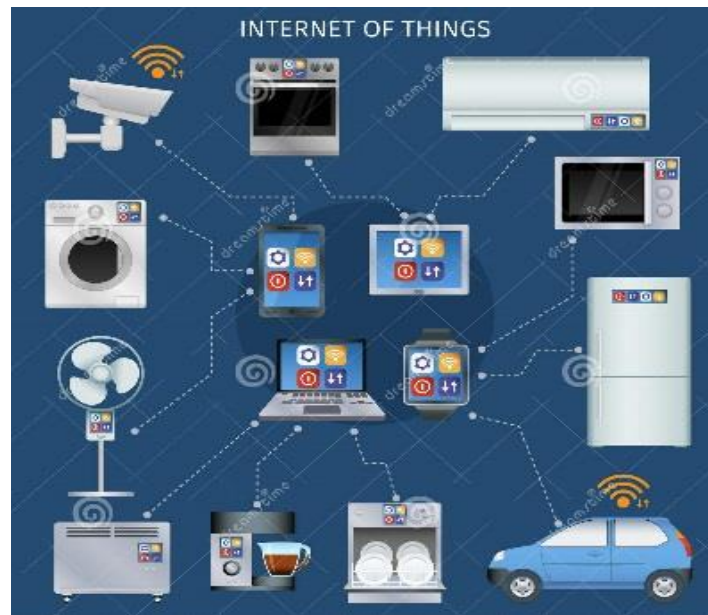
Hope this article gives you a fair idea of what an Arduino board is and what it does!

S. Noor Md Khasim (ECE-3/4-A)

## INTERNET OF THINGS(IOT)

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You walk upto your front door and it unlocks as it recognizes the key in your pocket. It is 6 AM, what if your alarm clock communicates with coffee maker and water heater so that they are ready for you when you wake up? This sounds more like a sci-fi movie but this type of future is going to come, thanks to the concept of Internet of Things. "The Internet of Things" is an environment in which objects, animals or people provided with unique identifiers and the ability to transfer data over a network without requiring human to human or human to computer interaction. The term Internet of Things is coined by British entrepreneur Kevin Ashton in 1999. Every thing surrounding you is connected to internet starting from small electronic devices like headset, chargers to electrical devices



like tv,fans,refrigerator etc,.. Ceiling fan with sense ME technology adjusts the speed of fan based on room's humidity and temperature,it can also sense whether the room is occupied ,so that it doesn't waste energy cooling an empty room We are in the midst of the earliest days of the internet of things,new ideas and new companies are popping up left and right and bigger players are swooping in to snap up some of the pioneers. Google spent billions to buy Nest,Dropcam and Revolv; Samsung picked up Smart Things and Microsoft partnered with Insteon. The first inter connected appliance is a modified coke machine in 1982 at Carnegie Mellon University,we can know whether the coke is cold and ready to serve without going downstairs.This concept became popular in 1999,through auto ID centre at MIT and related market analysis publications.According to Gartner,Inc.(a technological research and advisory corporation),there will be nearly 26 billion devices on the internet of things by 2020.Integration with the internet implies that devices will utilize an IP address as a unique identifier .However due to limited address space of IPv4(which allows for 4.3 billion unique addresses),objects in the IoT will have to use IPv6 to accommodate the extremely large address space required. IoT utilizes sensors to environment monitoring applications.They sense the quality of water,moisture in air .They can also be used to provide emergency services like earth quake or tsunami warning systems.The use of IoT can be expanded upto smart city.IoT can also be used in healthcare systems used to enable remote health monitoring and emergency notification systems. The IoT will be worlds massive device market and save companies billions of dollars.The IoT will be the largest device market in the world.It is estimated that by 2019 it will be more than double the size of smart phone,pc,tablet market combined.The IoT will result in \$1.7 trillion in value added to the global economy in 2019.This includes hardware,software installation costs,managements services and economic value added from realized IoT efficiencies.Device shipments will reach 6.7 billion in 2019

for a five year CAGR of 61%.The enterprise sector will lead the IoT ,accounting for 46% of device shipments this year. While many technologists tout the Internet of Things as a step towards a better world, many sholars raise doubt about the privacy of personal information. If somebody could hack into your coffee maker and take all your personal data? According to a survey in 2014 ,39% of respondants said that security is biggest concern in adopting IoT technology.A concern regarding IoT technologies pertains to the enviroomental impacts of the manufacture,use and eventual dispose of all these semi conductor rich devices.Electronic components are often dumped into regular landfills thereby polluting soil,ground water and air.It can be fatal to hums health and they are extremely difficult to recycle.For example a traditional house built with 15 light switches and 30 electrical outlets might stand for 50 years,with all those components still being original at the end of that period.But a mordern house built with the same number of switches and outlets set up for IoT might see each switch and outlet replacde for every 5 years, in order to keep up to date with technological changes. So, with the use of IoT environmental effects can be expected to increase.

Sohan Reddy. ECE-A -3/4

## **FLEXIBLE ELECTRONICS**

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Flexible electronics or Flextronics describes a circuit that are flexible and can bend and stretch, enabling significant versatility in applications. The common, rigid printed circuit boards are slowly being replaced by a thin ribbon of resilient, high-performance electronics.

Flextronics employs a hybrid technology that mixes traditional electronics with flexible, high-performance electronics and new 3-D printing technology. The system incorporates 'inks,' which are based on metals, polymers and organic materials, to tie the system together electronically. Using this technology, a razor-thin silicon integrated circuit, and a few hundred nanometers thick is placed on a flexible, bendable or even foldable, plastic-like substrate material. To allow electronics to be bendable or stretchable after fabrication, liquid gallium alloys are used as an electrical interconnect material. While these liquid alloys typically oxidize within minutes and become essentially useless, but the effects of the oxidation has been dramatically reduced through the use of ionic species confined to the walls of microvascular channels within the flexible substrates.The result is thin, foldable material that allows





the circuitry to fit into extremely tight spaces and even to be integrated into complex curved surfaces, such as an airplane's wing, or even a person's skin.

Flextronics can bring significant advancement in various fields like packaging, medical, lighting and mainly in consumer electronics.

In aircraft applications, the hybrid flexible system can be used to monitor stresses and strains and report this information through miniature embedded antennas to ground crews or a pilot. This can also be used in developing a device to monitor a person's health. This involves a biosensor system that can measure heartbeat, hydration levels, sweat, temperature and other vital signs through miniature circuitry. The system would be embedded on a flexible wearable patch. In consumer electronics many developments are made and flexible or bendable phone are being manufactured.

Recently LG has showcased their flexible TV which can even be rolled just like a newspaper. They showed off a working 18 inch version and is working increasing the screen size. It uses a special film instead of plastic as backing to allow screen to be rolled into a tube. Flextronics have potentially many applications and can transform future.



LG's flexible TV

Tarun Kumar Singh, ECE-A (3/4)

## VEIN VISUALIZATION TECHNOLOGY

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This article is for people who are scared of injections and added to that fear, the nurse struggling to find your vein or you're probably used to someone jabbing at your arm for five minutes before giving up and moving to the other one because your veins are "difficult to find". But don't worry, this device is about to make the process a whole lot less painful. This is device which will solve our problem. It is used to project the images of veins on our hand. It works by shining near

infrared light onto your arm. The device sends infrared light and it absorbs the haemoglobin in the blood and the images are projected on the skin.



It may look a little radioactive, but the device is very safe. The **Near-Infrared (NIR) window** defined the range of wavelength from 650 to 1350 nm where light has its maximum depth of penetration in tissue. Within the NIR window, scattering is the most dominant light-tissue interaction, and therefore the propagation light becomes diffused rapidly. Since scattering increases the distance travelled by photons within tissue, the probability of photon absorption also increases. Because scattering has weak dependence on wavelength, the NIR window is primarily limited by the light absorption of blood at short wavelengths and water at long wavelengths. The technique using this window is called NIRS. Medical imaging techniques such as fluorescence image-guided surgery often make use of the NIRS window to detect deep structures.

The technology works by beaming harmless near-infrared light at your arm. Our veins contain a lot of deoxygenated haemoglobin, and because this is absorbed by infrared light, it creates an image of exactly where your veins are under the skin.

Importantly, the device can be used anywhere. It's already used widely in hospitals and pathology clinics around the world to make it easier for patients to have blood taken, but now it's also going to help generous citizens to donate blood.

The Australian Red Cross is the first blood bank service in the world to trial this technology, and has already started using it in its Sydney clinics.

Lisa ECE-A(3/4)

