

Career Episode-3

A. Introduction

Duration:

Location:

Organization:

Field:

Title:

B. Background

CE 3.1

CE 3.2

The largest portion of India's population depends upon agriculture. Agriculture is the most important occupation for the most of Indian farmers. A large level of the industries are agro-based. Agriculture plays an important role in overall growth and GDP of the country. But the system of manual agriculture and farming becomes a root of the problem faced during the cropping or the harvesting. To enhance the efficiency of the farming and land, it becomes important to maintain the proper moisture into the land so the growth of harvested crops is proper and this is only possible with the proper monitoring of the soil and the Moisture content in atmosphere. This project directly leads to solve this problem by using the Internet of things, for the monitoring the overall activities of the land and the atmosphere and controlling different parameters according to required needs.

CE 3.3

The working principle of this project is a basic “Internet of Things” generally known as IOT. A general assembling of different components like the microcontroller and the GSM module is done. The microcontroller with the help of sensors monitor the moisture and other parameters and save it in a remote database which can be easily accessed from any remote device, which is connected to the internet.

CE 3.4

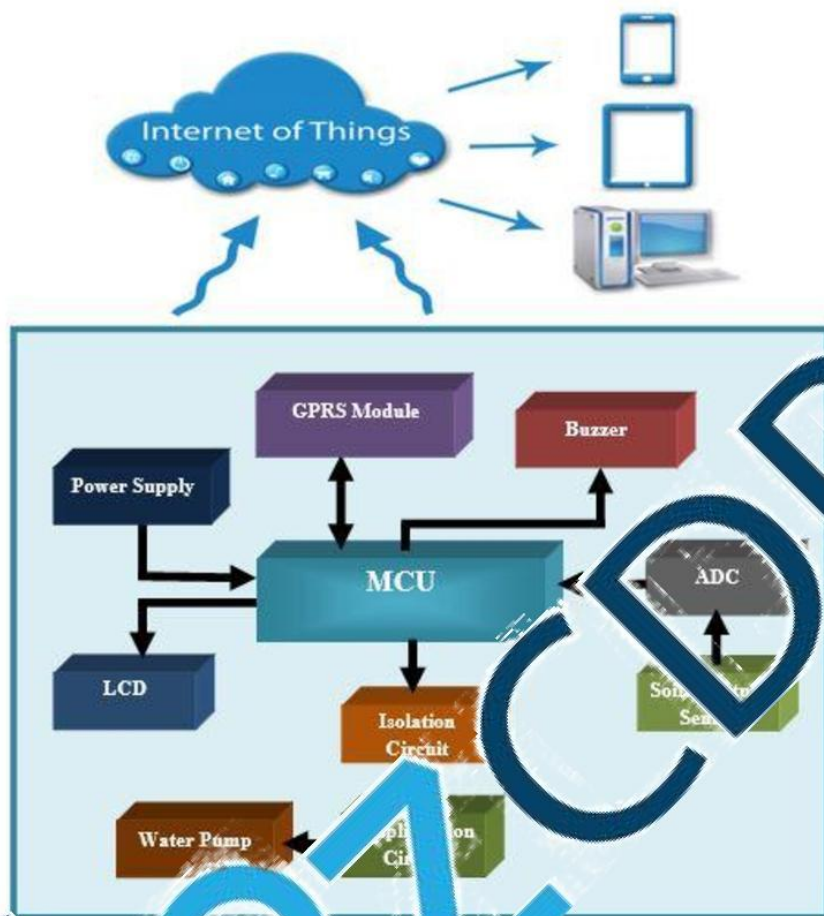
My duties and responsibilities for this particular project. Which has to be completed during the project work:

- Justify the problem defined while the introduction of the project.
- Designing the overall workflow and layout of the Project.
- Accumulating the data for checking the feasibility of the project.
- Procurement of the components.
- Cost Estimation and project description.
- Assembling of the whole project according to their different modules.
- Testing for the final project after individual module testing.
- Troubleshooting if needed.

C. Final Engineering

CE 3.5

I started this project to accomplish my objective, I started with a rough sketch of the objectives which has to be achieved as the basic sketch of the block diagram. As I proceeded further a clear roadmap of the project is started building and a proper layout of the block diagram is created in order to understand the project coordination and communication. The final block diagram of the project is depicted below:



As shown in this diagram two way flow is required between the GPRS module and the MCU unit for the data exchange and the transmission. Soil moisture sensor is connected by the means of ADC to convert analogue sensor output into the digital input to the MCU, Similarly water pump is connected by means of the isolation circuit to protect the MCU from back EMF and amplification circuit to amplify the MCU output voltage. Some other components are also connected for their individual uses.

CE 3.6

To understand the project, it is necessary to understand the concept of “Internet of Things”. Today when the computers and internet are extensively used for controlling the devices, which is almost wholly dependent of the humans for information, nearly all the data available on computers and internet is created by humans. As the humans have limited time and accuracy,

if the computer take that position to gather the data without the help of humans, it drastically reduces the waste, loss and cost of the process. This is where Internet of things comes into play, it helps to remotely accesses the data or the devices through web server and cloud computing. IOT mainly consist of two technologies telemetry and teleremote. In the Telemetry the automated communication is for the data measurement and collection at a remote or inaccessible point. Whereas the tele-remote is the concept in which user remotely control/ manage the devices.

CE 3.7

Procurement of the component not only limits to the buying of component but also economic analysis of each and every component and the selection of the component on the basis of problem and the requirement of component, it is also intended that the components are easily available and at an economical cost. As the different types of component are available in the market to perform the same task, it becomes an art to select the right component and if the selection goes wrong it is possible that the whole product does not act like the requirement.

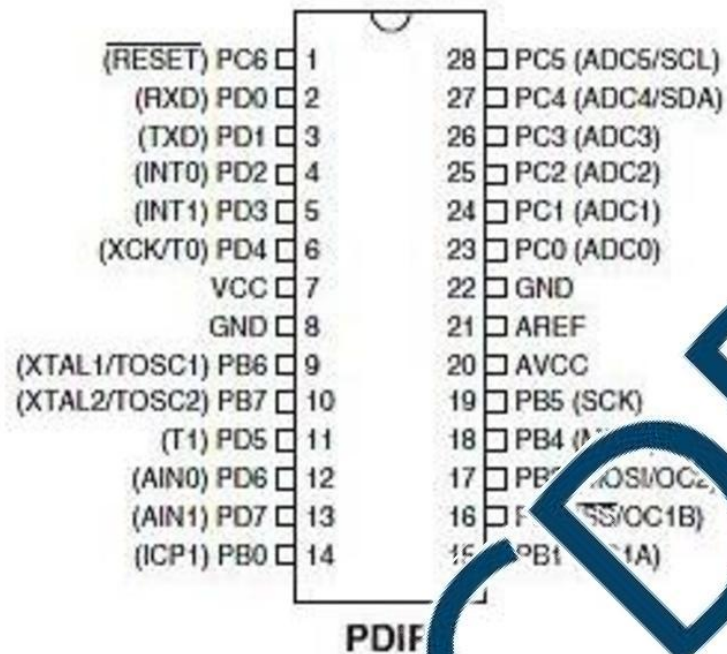
CE 3.8

Microcontroller

It is a complete package of ports, memory to store and execute instruction, all the listed feature is already available in the microcontroller. Talking about the ability to control the devices microcontroller possess the I/O ports by the devices can connected and controlled by the means of microcontroller. In this project I used the ATmega8 microcontroller manufactured by the AT&TEL Corporation. The ATmega8 is a low-power CMOS 8-bit microcontroller based on the AVR RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega8 achieves throughput approaching 1 MIPS per MHz, allowing the system designed to optimize power consumption versus processing speed.

The reason to adopt this microcontroller is that it is a 28 pin device and one of the most popular microcontroller used in the complex operations. The pin diagram of ATmega8 is given below

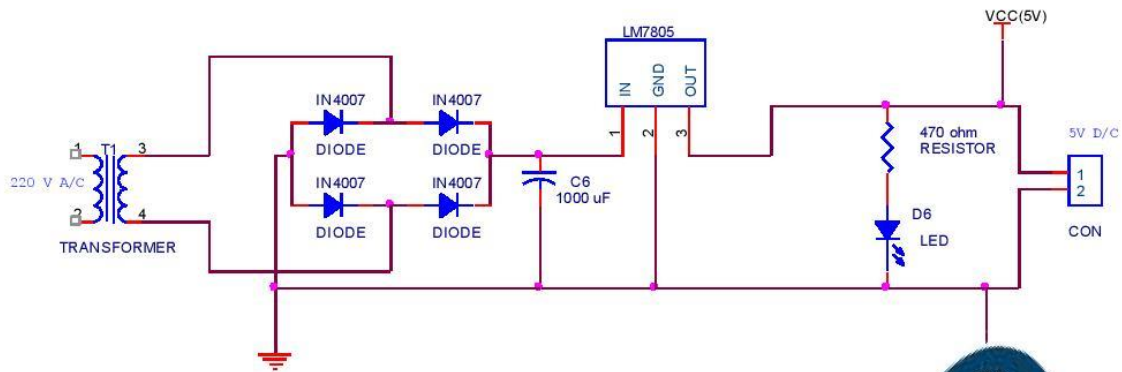
ATmega8



CE 3.9

Power Supply

The power supply is designed to convert the high voltage coming from AC mains to a suitable low voltage DC supply. In the next module, the task is to test the power supply. In this project, the power supply is used to power the microcontroller as well as the other parts of the project. A regulated power supply of 5V is required to power the microcontroller. Power supply is the most important component of any project as the project working is depends totally upon the power supply. After connecting the power the different parts and the microcontroller is tested. The circuitry of the power supply is given below, in power supply a step down transformer, a bridge rectifier, and a capacitor is generally used for regulating the voltage by the power supply.



CE 3.10

Soil moisture Sensor

Soil moisture sensors measure the water content in soil. A soil moisture probe is made up of multiple soil moisture sensors.

Measuring soil moisture is important in agriculture to help farmers manage their irrigation systems more efficiently. Not only are farmers able to get more crops with less water to grow a crop, they are able to increase the yield and the quality of the crop by better management of soil moisture during critical plant growth stages.

Besides agriculture, there are many other disciplines using soil moisture sensors. Golf courses are now using sensors to increase the efficiencies of their irrigation systems to prevent over watering and leaching of fertilizers and other chemicals offsite.

As the output for the sensor is analogue and the microcontroller runs on a digital input the ADC converter is used to convert the analogue signal into digital signal before transmitting it to the microcontroller.

CE 3.11

Buzzer

Buzzer will be used as an audio alarm in this project. A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers

and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke.

There are many types of Buzzers like:

- Mechanical Buzzer
- Electromechanical Buzzer
- Piezoelectric buzzer

The buzzer I used in this project is a piezoelectric buzzer. Instead of this buzzer a mechanical buzzer with combination of speaker as an audio alarm can also be used in this project. The various musical ICs (like UM66) with different musical sounds are available in the market.

CE 3.12

DC Series Motor Drive

A simple DC motor has a coil of wire that carries current in a magnetic field. The current in the coil is supplied via two brushes that make mechanical contact with the coil. The coil lies in a steady magnetic field. The forces exerted on the current-carrying wires create a torque on the coil.

The motor at some time produces a back EMF, to protect the microcontroller from this an isolation circuit is used before connecting the motor to the microcontroller.

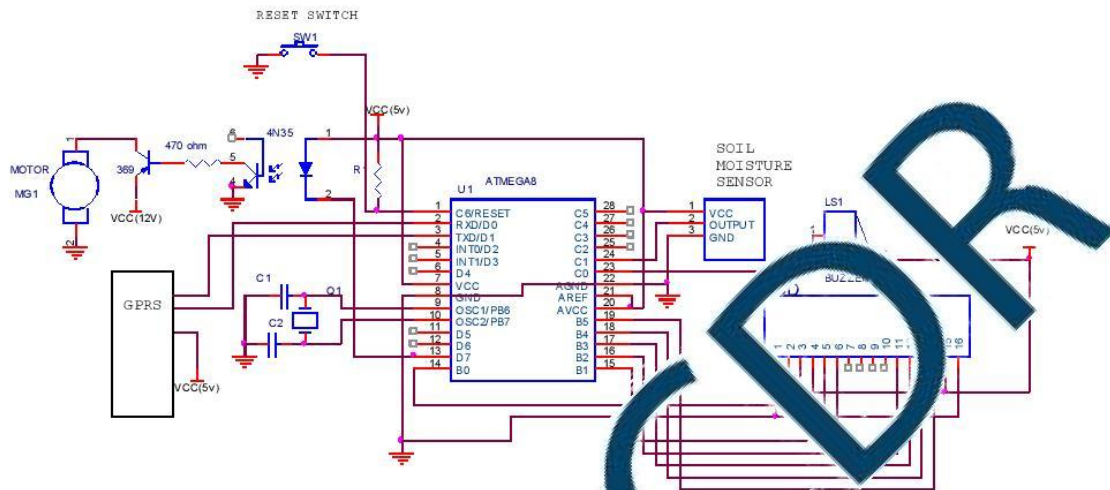
CE 3.13

GSM interfacing

I used GSM SIM 900 module as a communication device to connect the device to the internet to the server and can be extracted on the web page. With a tiny configuration of 24mm x 24mm x 3 mm, SIM900 can fit almost all the space requirements in your M2M application, especially for slim and compact demand of design.

CE 3.14

After the selection of the components the arrangement and assembling it on a circuit board is also an important task, it has to be done carefully in order to get the required result. The circuit diagram of the whole project is given below according to which the circuit is assembled.



CE 3.15

IOT is basically a module design to remotely access the devices through web server and cloud computing. There are mainly three scripting languages used now-a-days i.e. JSP, ASP, PHP. I prefer to use PHP because it is an open source scripting language, runs on various platforms (Windows, Linux, Unix, Mac OS X, etc.), compatible with almost all servers used today (Apache, IIS, etc.), supports a wide range of databases, runs efficiently on the server side. I use MySQL database for storing our data in a managed way and different queries are passed through the PHP scripting to fetch the monitored data and to push the required command to the GSM module.

CE 3.16

The simple IOT based project I developed has a vital application in the field of the agriculture as it monitors the soil moisture and give the users control to turning the motor on or off by automatic or the manual means using the webpage developed by the PHP scripting.

A soil moisture sensor sense the moisture content in the soil and give the data to the microcontroller, which push this data to the remote server using the GSM module which is connected to the internet. Now this data is stored in the remote server in a managed way by the MYSQL which get fetched to the webpage using the PHP scripting and the queries. By monitoring this data from a remote location a user can give command to turn the motor on or off or can apply a threshold moisture limit so that the motor automatically operate within that limits.

D. Summary

CE 3.17

Contributing Society is become important as we are all part of the society. From this project we not only learned about the engineering and technical concepts but a lot about the scenario of the Indian agriculture. As the engineering point of view we can correlate the society with engineering in numerous manner. If we view the project from the technical prospective there are abundant learning and technical skills which enhanced the knowledge during the project. Understanding the concept is always enthusiastic and confidence booster. After the development of the project we can say that I groomed myself in both technical and social manner.