GLOBAL
Institute of Engineering & Technology

Institutional Distinctiveness

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Our founder Secretary, Mr. K. M. Arifuddin is a prominent educationist with 40 years of dedicated service in the field of education and with an ideology **"Education for all"**- specifically to the students from rural back ground and under-privileged sections. He also nurtures a dream of all round excellence for education, particularly to girls of lower middle class society who come from diverse back ground and communities.

Madina Education and Welfare Society (MEWS) though a minority society, started the professional colleges under the title of **GLOBAL PROFESSIONAL COLLEGES** (Global Institute of Engineering & Technology, Global College of Pharmacy and Global Education Center) to extend quality education to all the non-minority communities as a best example of secularism. The college has been an epitome and epicenter of high standards as our students have unleashed their wings all over the globe. The institute is offering a holistic, progressive and creative system of technical education that blends with a sense of responsibility and character building.

The transformation and empowering of the students is also taken care of to make them **"reach out"** to the surrounding rural community. This is also helpful in taking them go beyond books to bring closer to the environment, inculcate sensitivity and responsibility towards nature. Our mission indicates a provision of academic freedom generating and disseminating knowledge with interdisciplinary approach.

It is indeed a proud privilege to state that our college is permitted to adopt five villages in the vicinity under Unnat Bharath Abhiyan- UBA, an initiative of MHRD in the year 2018. The five villages which our college has adopted are, Chilkur, Chanda Nagar, Mothkupally, Kanakamamidi and Yenakapally. UBA is flagship programme of Ministry of Human Resource Development (MHRD), Govt. of India to provide an opportunity and to enable faculty and students of Higher Educational Institutions to work with the people of rural India. The aim of this project is identifying developmental changes and evolving appropriate solutions for accelerating sustainable growth of villages with new technology.

In this context it was planned to go for a new technique in organic farming using Internet of Things (IoT) technology. IoT technology is steadily revolutionizing the agricultural sector. Precision agriculture has brought technology into agriculture since the start of this century. The emergence and adoption of IoT technology is lifting this industry to a never before seen level.

Smart Farming: The Smart Farming has ability to influence the agriculture sector as it reduces waste and enhances productivity. It is also the application of modern Information and Communication Technology (ICT) where a system is built for monitoring the crop field with help of sensors and certain Apps. Using smart phones we can monitor the field conditions like light, humidity, soil, moisture etc. from anywhere by just a click. With the introduction of Industrial Internet of Things technologies (IoT) in Agriculture, far more advanced sensors are being used. The sensors are now connected to the cloud via cellular/satellite network which lets the farmers to know the real-time data from the sensors.

Farmers in the 21st century have access to GPS, soil scanning, data management, and IoT. By precisely measuring variations within a field and adapting the strategy accordingly, farmers can greatly increase the effectiveness of pesticides and fertilizers, and use them more selectively. Smart Farming techniques are useful in preventing crop diseases and can make agriculture more profitable for the farmer.

In short smart farming is "taking the right cultivation measure at the right place at the right time".

IoT Based Smart Farming: Application of IoT in agriculture could be a life changer for humanity and the whole planet. With use of many sensors, gateways and seamless end-to-end solutions help ensure that smart farming becomes a factual reality. The IoT-based smart farming automates the irrigation system and is highly efficient as compared to the conventional farming.

The following are the benefits of adopting new technology - Internet of Things in Agriculture:

1. Climate conditions: IoT based smart farming enables us to know the real-time weather conditions. Sensors are placed inside and outside of the agriculture fields. They collect data from the environment which is used to choose the right crops which can grow and sustain in the particular climatic conditions. The whole IoT ecosystem is made up of sensors that can detect real-time weather conditions like humidity, rainfall, temperature etc.

2. Precision Farming: Precision Farming is one of the most famous applications of IoT in Agriculture. It makes the farming practice more precise and controlled by realizing smart farming applications such as livestock monitoring, vehicle tracking, field observation, and inventory monitoring. With the help of Precision farming, we can analyze soil conditions and other related parameters to increase the operational efficiency.

3. Data Analytics: In the IoT world, sensors are the primary source of collecting data on a large scale. The data is analyzed and transformed to meaningful information using analytics tools. The data analytics helps in the analysis of weather conditions, livestock conditions, and crop conditions. The data collected leverages the technological innovations and thus making better decisions. Using predictive analytics, we can get an insight to make better decisions related to harvesting.

Smart Farming

IOT based Smart Farming at GIET

In the present era one of the greatest problems faced by the world is water scarcity and agriculture being a demanding occupation consumes plenty of water. Therefore a system is required that uses water judiciously. Smart sprinkler systems estimate and measure diminution of existing plant moisture in order to operate a sprinkler system, restoring water as needed while minimizing excess water use. This system is specific for a crop and hence its usage is limited. Proper scheduling of irrigation is critical for efficient water management in crop production, particularly under conditions of water scarcity.

Agriculture is the major source of income for the largest population in India and is major contributor to Indian economy. A few initiatives have also been taken by the Indian Government for providing online and mobile messaging services to farmers related to

agricultural queries and agro vendor's information to farmers. Based on the survey it is observed that agriculture contributes 27% to GDP, and provides employment to 70% of Indian population.

According to statistics, agriculture uses 85% of available freshwater resources worldwide, and this percentage will continue to be dominant in water consumption because of population growth and increased food demand. There is an urgent need to create strategies based on science and technology for sustainable use of water, including technical, agronomic, managerial and institutional improvements. Agricultural irrigation based on Internet technology is based on crop water requirement rules. By using Internet technology and sensor network technology we can control water wastage and to maximize the scientific technologies in irrigation methods.

The Internet of Things (IoT) is a technology where in a mobile device can be used to monitor the function of a device. The Internet of Things (IoT) is concerned with interconnecting communicating objects that are installed at different locations that are possibly distant from each other. Internet of Things (IoT) is a type of network technology, which senses the information from different sensors and makes anything to join the Internet to exchange information.

Wastage of water is the major problem in agriculture. There are many techniques to save or to control wastage of water in agriculture. The objectives of the system are to

a) Conserve energy and water resources

b) Handle the system manually and automatically

c) Detect the level of water.

Evapo -Transpiration (ET), thermal imaging, capacitive methods, and neutron scattering method and gypsum blocks are some of the technologies that enable moisture sensing. Capacitive sensors, however instantaneous, are costly and need to be calibrated often with varying temperature and soil type. Neutron probe based moisture sensors are very accurate but present radiation hazards, calibration difficulty and are costly. A large agriculture field presents is with different part of areas, hence, moisture measurement at a single location in the field does not make much sense. Consequently, what is required is a distributed number of sensor nodes and scattered pumping units to pump water to those specific locations covered by the

sensor units. An automated irrigation unit, in conjunction with a low cost moisture sensor, is proposed.

Over the past 15 years, farmers started using computers and software systems to organize their financial data and keep track of their transactions with third parties and also monitor their crops more effectively .In the Internet era, where information plays a key role in people's lives, agriculture is rapidly becoming a very data intensive industry where farmers need to collect and evaluate a huge amount of information from a diverse number of devices (eg., sensors, faming machinery etc.) in order to become more efficient in production and communicating appropriate information .With the advent of open source Arduino boards along with cheap moisture sensors, it is viable to create devices that can monitor the soil moisture content and accordingly irrigating the fields or the landscape as an when needed.

Smart Irrigation System

Smart irrigation systems offer a variety of advantages over traditional irrigation systems. Smart irrigation systems can optimize water levels based on things such as soil moisture and weather predictions. This is done with wireless moisture sensors that communicate with the smart irrigation controls and help to inform the system whether or not the landscape is in need of water.

The Smart Irrigation System is an IoT based device which is capable of automating the irrigation process by analysing the moisture of soil and the climate condition like raining. Also the data of sensors will be displayed in graphical form on BOLT cloud page. The advantages of these smart irrigation systems are wide reaching. The smart irrigation system will help you have better control of your landscape and irrigation needs as well as peace of mind that the smart system can make decisions independently if you are away and save our water bills.

Resources are precious. With smart irrigation systems we can be better stewards of our resources which is better for the environment. Smart Irrigation System uses valves to turn irrigation ON and OFF. These valves may be easily automated by using controllers and solenoids. Automating farm or nursery irrigation allows farmers to apply the right amount of water at the right time, regardless of the availability of labor to turn valves on and off.

Overview:

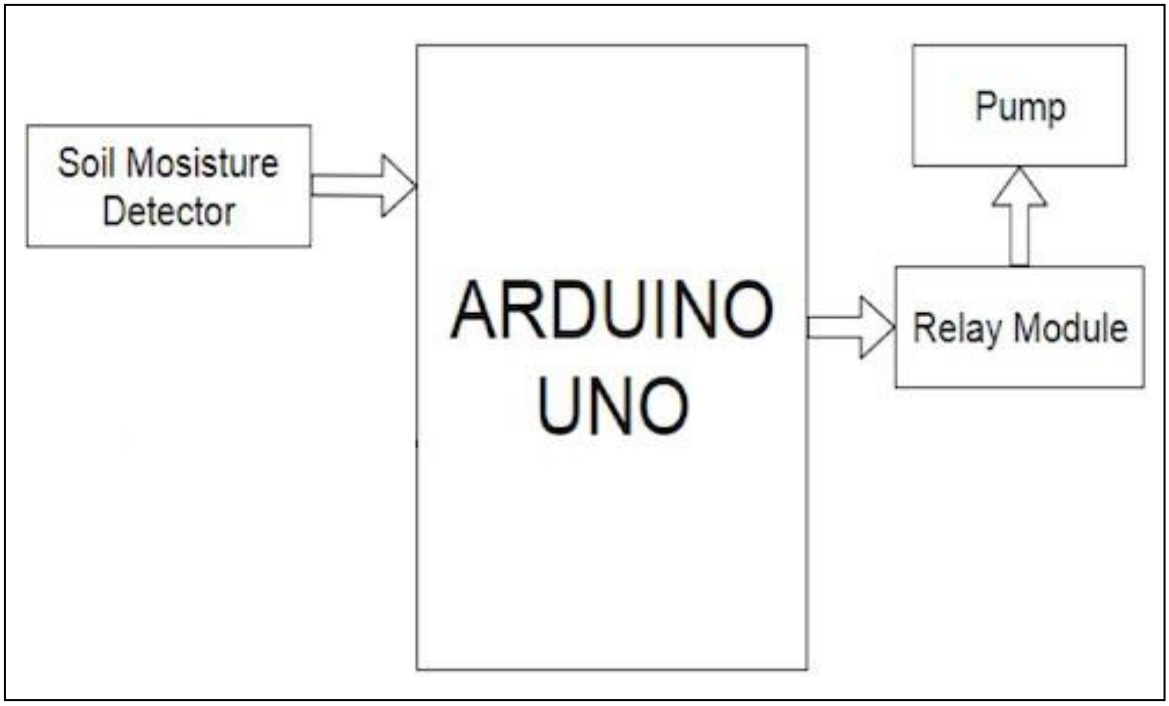
Smart water switch is an IoT based Smart Home project which can be implemented in households of an individual for automatic watering of plants, to automate the process of switching on and off the motor that pumps the water from the water tank to the water plants. The user can also monitor moisture content and microcontroller observes the less content of water and turn on the motor.

Problem Definition:

This work focuses on a solution for 'Watering plants' in urban and rural areas with the help of IoT. Every Plant is precious and the regular supply of water needs to be done. Plants are dying due to shortage of water supply. To maintain the supply of water, it is important to have systems to remind us to water the plants and hence we have designed an IoT system with which one can plan usage of water according to the moisture content of plants.

Proposed System:

This Figure is an overall block diagram of Arduino based automatic irrigation system which consist of three sensors which are connected to controller and sensed values from these sensors are send to the mobile application.



Block Diagram of Project Concept

The figure shows the block diagram of smart irrigation system with IoT. Farmers start to utilize various monitoring and controlled system in order to increase the yield with help of automation of an agricultural parameters like temperature, humidity and soil moisture are monitored and control the system which can help the farmers improve the yield This proposed work includes an embedded system for automatic control of irrigation. This project has wireless sensor network for real-time sensing of irrigation. System. This system provides uniform and required level of water for the agricultural farm and it avoids water wastage.

When the moisture level in the soil reaches below threshold value then system automatically switch ON the motor. When the water level reaches normal level the motor automatically switch OFF.

Objectives:

1. To develop an automated system that solves most problems related to irrigation and agriculture, such as controlling and saving both the water and electricity.

2. To enhance agricultural production using small quantities of water.

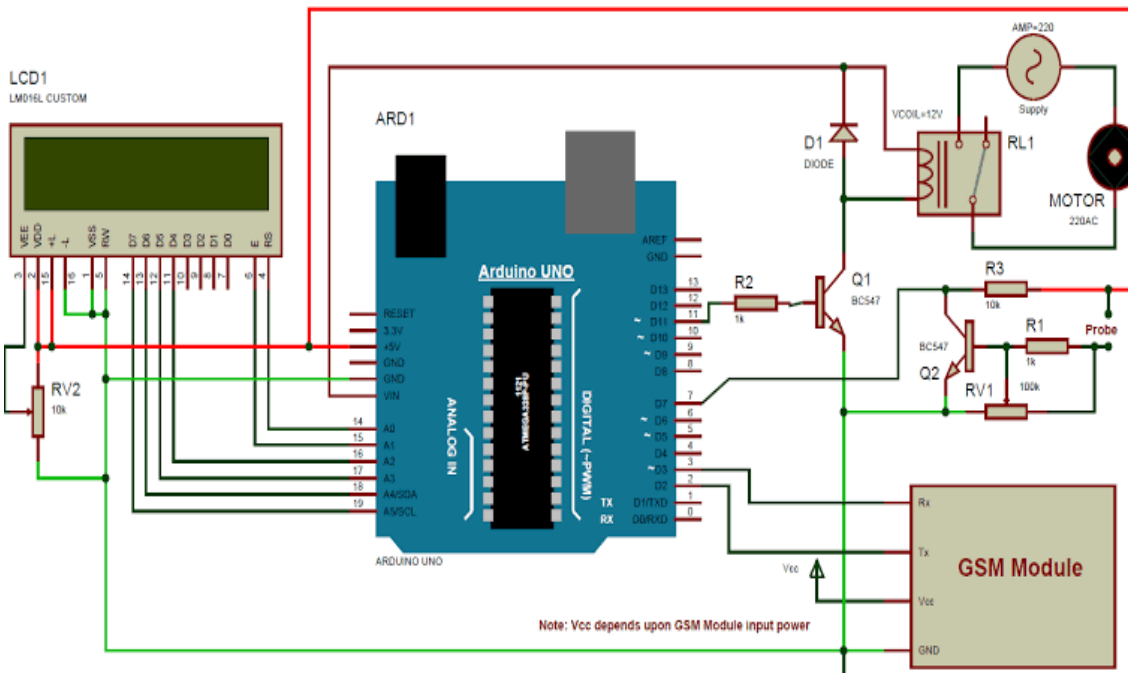
3. To minimize manual intervention in watering operations with increasing watering speed, and to make the automated system sustainable option to be considered to improve the agriculture and irrigation efficiency.

4. To discover the excellent automation technique for irrigation system automatically controlled through software in a way that allows the user to monitor all information and manage the device immediately from mobile.

Design Methodology

Hardware Design: The Automated Irrigation system based on soil moisture using Arduino is quite familiar in modern days. The system is comprised of Arduino UNO Board, LCD, DHT11 Sensor, and pH Sensor, Soil Moisture Sensor, Pump and Solar Panel. The probe of the soil Moisture Sensor will sense the moisture content of the soil and data will be sent directly to the microcontroller. The Arduino acts as the base controller of the system. The DHT11 sensor is used to measure the temperature and humidity of the root zone of the plants in dynamic (dry and wet) conditions and is connected to the Arduino board. The analog sensor readings are connected to the ADC pin of the controller, which will convert the analog signals into digital format. The microcontroller will display the values of moisture content along with the other

readings from DHT11 sensor i.e. the temperature and humidity on the LCD screen. A 12V water pump is used with the control unit for automatic plant watering system. The whole system is powered through solar cell so that inefficient supply of electricity cannot be a problem in watering the crops in rural area.



Project Concept - Circuit Diagram

Automated Irrigation System Operation

The soil moisture sensor must be check the upper and lower boundaries of the analog value from pin A0 before it is converted to digital value. In the code fragment reads the sensor value from the soil moisture sensor. The value which is analog value is then converted into digital value either to be used for switching on the water pump or to be displayed on the Serial Monitor. The code fragment converts the upper bound 400 into 100% and lower bound 900 into 0% respectively in the last statement of the code.

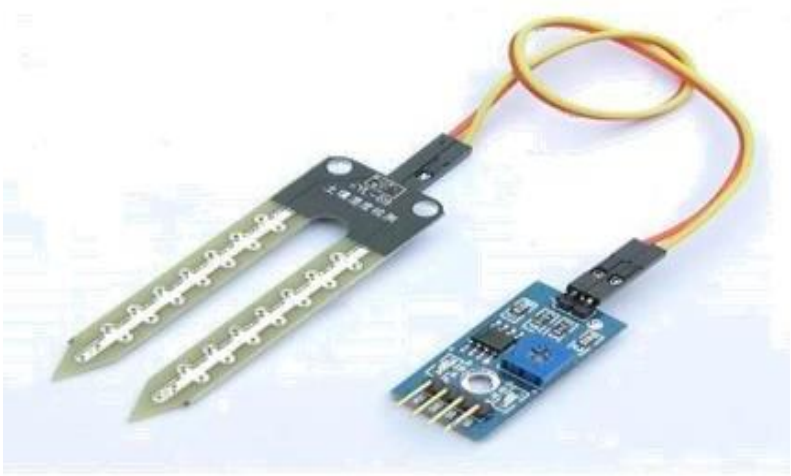
```
int WATERPUMP = 13; //motor pump connected to pin 13
int sensor = A0; //sensor analog pin connected to pin A0
int val; //This variable stores the value received from Soil moisture sensor.
void setup()
```

```
pinMode(13,OUTPUT); //Set pin 13 as OUTPUT pin

Serial.begin(9600);

pinMode(A0,INPUT); //Set pin A0 as input pin, to receive data from Soil moisture
sensor.Serial.println("reading the sensor values");  delay(100);

}

void loop()

val = analogRead(A0); //Read data from soil moisture sensor

if(val>500)

  {

digitalWrite(13,HIGH); //if soil moisture sensor provides LOW value send LOW value to
motor pump and motor pump goes off

Serial.println("motor on");

Serial.println(val);

delay(100)  }

else

{

digitalWrite(13,LOW); //if soil moisture sensor provides HIGH value send HIGH value to
motor pump and motor pump get on

Serial.println("motor off");

Serial.println(val);

delay(100);

  }

}
```

Code Fragment for setting the Serial Monitor and water pump.

Selection of Components

1. Soil Moisture Sensors



Soil Moisture Sensor

This sensor can be used to test the moisture of soil, when the soil is having water shortage, the module output is at high level and the output is at low level. By using this sensor one can automatically water the flower plant, or any other plants requiring automatic watering technique. Module triple output mode, digital output is simple, analog output more accurate, serial output with exact readings.

Soil moisture sensors measure the water content in soil. A soil moisture probe is made up of multiple soil moisture sensors. One common type of soil moisture sensors in commercial use is a Frequency domain sensor such as a capacitance sensor. Another sensor, the neutron moisture gauge, utilize the moderator properties of water for neutrons. Soil moisture content may be determined via its effect on dielectric constant by measuring the capacitance between two electrodes implanted in the soil.

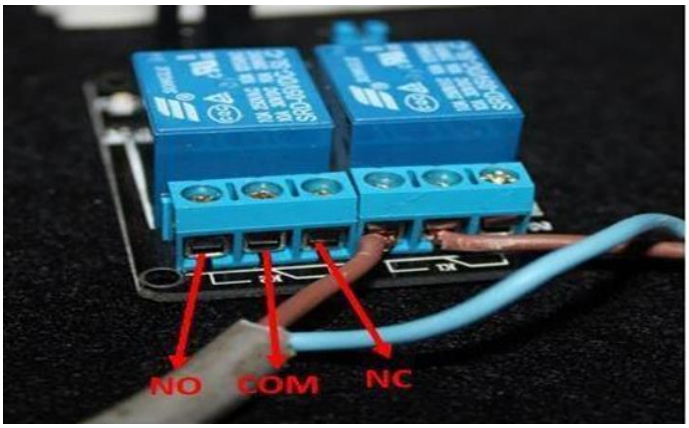
pH Sensor

pH is the measure of acidity or alkalinity of water solution which is determined by the relative number of hydrogen (H+) or hydroxyl (OH-) ions present. The pH value (below 7) is said to be acidic and (above 7) is said to be basic. The pH of a solution can change with temperature respectively.

DHT11 Sensor

DHT11 sensor is used for measuring temperature and humidity. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air. This sensor is cost effective, provides low power consumption and up-to 20 meter signal transmission is possible.

2. Relay Module (3V)



Relay Module

A relay is an electrically operated switch that can be turned on or off, letting the current go through or not, and can be controlled with low voltages, like the 5V provided by the Arduino pins or 3.3V provided by the Node cu. There are other relay modules that are powered using 3.3V, which is ideal for ESP32, ESP8266, and other microcontrollers.

3. NC (Normally Closed)

The normally closed configuration is used when you want the relay to be closed by default, meaning the current is flowing unless you send a signal from the Node mcu to the relay module to open the circuit and stop the current. NO (Normally Open): the normally open configuration works the other way around: the relay is always open, so the circuit is broken unless you send a signal from the Node mcu to close the circuit.

The connections between the relay module and the Aurdino are really simple:
GND: goes to ground.
IN: controls the relay (it will be connected to an Aurdino digital pin).
VCC: goes to 3.3V in Node mcu.

4. Jumper Wires

Jumper Wires

Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboard and other prototyping tools in order to make it easy to change a circuit as needed.

5. DC Motor

DC Motor

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic; to periodically change the direction of current flow in part of the motor. Here we are using motor to pump the water from reservoir to the tank.

6. USB Cable

USB was designed to standardize the connection of peripherals to personal computers, both to communicate with and to supply electric power. It has largely replaced interfaces such as serial ports and parallel ports, and has become commonplace on a wide range of devices. USB

connectors have been increasingly replacing other types for battery chargers of portable devices.

USB Cable

Examples of peripherals that are connected via USB include keyboards, pointing devices, digital still and video cameras, printers, portable media players, disk drives and network adapters.

7. Battery

Battery

For providing power supply to dc motor for water pump. A rechargeable battery, storage battery, or secondary cell, (or archaically accumulator) is a type of electrical battery which can be charged, discharged into a load, and recharged many times, as opposed to a disposable or primary battery, which is supplied fully charged and discarded after use. It is composed of one or more electrochemical cells.

Rechargeable batteries typically initially cost more than disposable batteries, but have a much lower and environmental impact, as they can be recharged inexpensively many times before

they need replacing. Some rechargeable battery types are available in the same sizes and voltages as disposable types, and can be used interchangeably with them.

Software Used: ARDUINO Ide

ARDUINO Ide- Software

The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux.

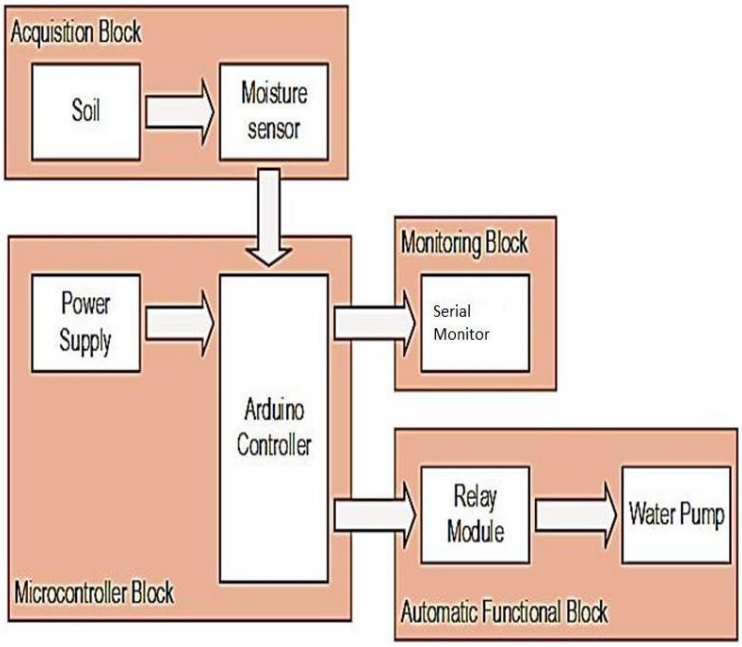
The environment is written in Java and based on Processing and other open-source software. This software can be used with any Arduino board.

Arduino is an open-source prototyping platform based on easy-to-use hardware and software. A text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuine hardware to upload programs and communicate with them. Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension in. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom right-hand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor. Verify Checks your code for errors compiling it. Upload Compiles your code and uploads it to the configured board. See uploading below for details. Note: If you are using an external programmer with your board, you can hold down the

"shift" key on your computer when using this icon. The text will change to "Upload using Programmer".

Hardware Implementation

This project design includes several functional blocks as shown figure, namely: acquisition block, microcontroller block, automatic functional block and monitoring block.



Block Diagram of Hardware Implementation Process

1. Acquisition Block

This block consists of one soil moisture sensor which takes the data from the soil. It depends on the moisture level of the soil whether to send high or low voltage to the microcontroller to show that it is wet or dry. When the soil is wet, it will send the low output voltage, whereas when it is dry, it will send the high output voltage. This sensor is directly connected to Arduino microcontroller.

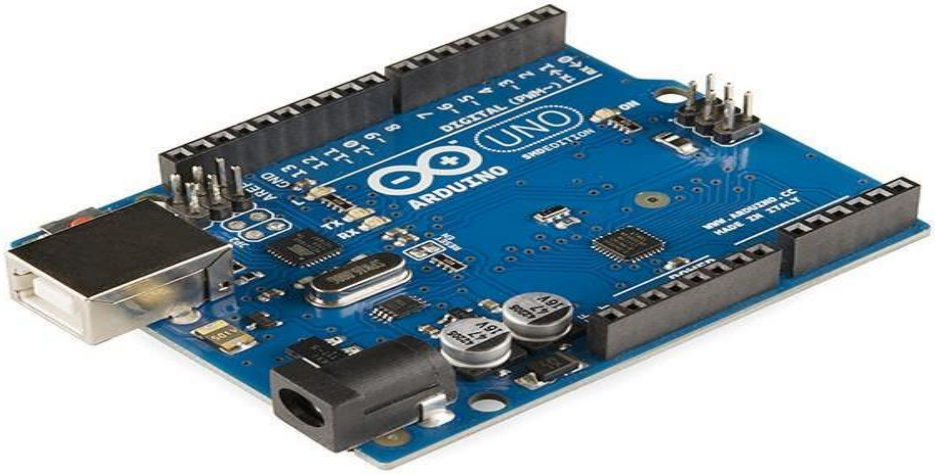
2. Microcontroller Block

In this block, Arduino Uno is the microcontroller which is the core hardware of this project. It receives the input from the soil moisture sensor and processes the input based on the requirement coded in the microcontroller.

3. Monitoring Block

This block includes a Serial monitor, which is used to monitor the level of soil moisture by showing the percentage of the moisture on the screen. When the soil is dry the percentage will be lower and vice versa. In addition, it also shows the pump status which is on or off, in which users will know the current pump status.

4. Automatic Functional Block



Automatic Functional Block

This block includes the automated watering function of the system. The automated function consists of two main controlling hardware, which is relay module and DC watering pump. The relay is an automatic electric switch that uses an electromagnet to move the switch from OFF to ON or vice versa. The switch controls the electric signal that pass through the water pump. When the moisture level is below the threshold level, Arduino sends a signal to the relay module to automatically open the path for the electric to pass through the water pump to water the plant.

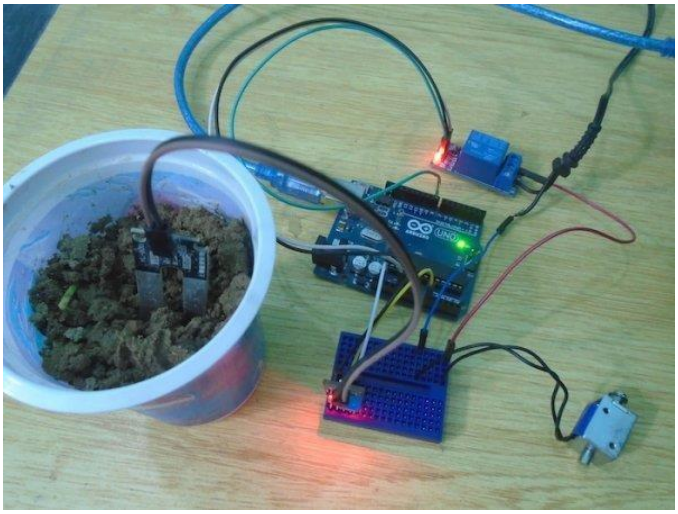
After the system detects the sufficient level of the water in the soil, the relay will close the path for electric and thus the water pump will stop immediately pumping the water.

All the hardware will be assembled to Arduino, which is the microcontroller that use to control all the hardware that attached to it and let it function. Figure shows the details of Arduino pins and their connection to the corresponding hardware, which are based on the Table.

Arduino pins and their corresponding hardware.

Hardware	Pin
Soil moisture sensor	A0, 5v, GND
Relay module	5V, GND, 13

The complete hardware setup of the proposed system which include the Arduino board and all the necessary attached hardware. This project is considered a complete prototype where it can be used and function for the daily life. From figure, it can be seen that the Arduino is the center of this system which connects all the required hardware.



Total Working Model

The Serial Monitor shows the value that the Arduino received from the moisture sensor. At the same time, the data acquired is sent to relay module to determine whether to switch on or off the water pump.

If the condition is met for the water pump to be switched on, the water pipe attached to the pump will begin to draw up the water from the water source, and push the water to the other side of water pipe to complete the watering process for the soil.

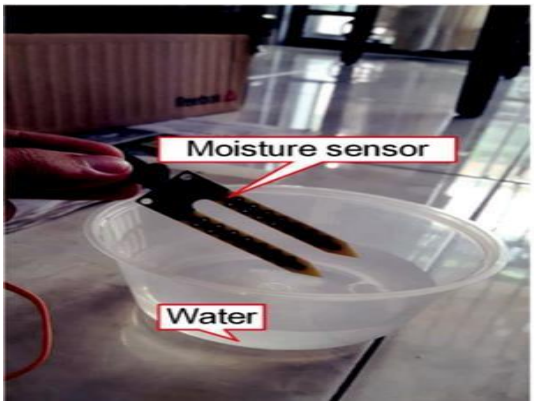
The code fragment is mainly for the printing of the percentage that is acquired from soil moisture sensor to determines whether the soil is wet or dry. The value from the sensor also determine whether to switch the water pump on or off. It is shown that when the soil moisture

percentage is below 38%, the water pump will be switch on automatically, and the LCD screen will show the water pump status is ‘ON’. When the soil moisture percentage reach 47%, the water pump will switch off automatically, and the LCD screen will show the water pump status is ‘OFF’.

Test Case

Parameters	Soil Moisture Sensor
Test Purpose	To test the sensor values and its functionality.
Test Environment	A glass of water and Arduino IDE.
Test	Open the serial monitor in Arduino IDE and see the sensor value for the dry condition. Open the serial monitor in Arduino IDE and see the sensor value for the dry condition. Immerse the soil moisture sensor into a glass of water and see for the wet condition in the serial monitor in Arduino IDE too.
Expected Result	The soil moisture sensor lights up in the controller when it is switched on, and it can show the lower and upper boundaries of the sensor value in dry and wet conditions.

5. Soil Moisture Sensor Test



Moisture Sensor Test for Dry Condition

Moisture Sensor Test for Wet Condition

This section describes the test strategy that is used for this project. The test is used to determine whether the hardware and software will be tested early to make sure that it is functioning according to the requirement.

The test shows that the soil moisture sensor capture high values for dry condition which are around 893 with 900 as the upper boundary. From the Figures, the test also shows that the soil moisture sensor capture low values for wet condition which are around 399 with 400 as the lower boundary.

Software Implementation

The Arduino Board is programmed using the Arduino IDE software. The function of the moisture sensor is to sense the water content present in the soil i.e., the moisture level in the soil. However to classify the readings of the soil moisture sensor for different moisture level of the soil, the analog output value should be converted to digital value which will be displayed on the LCD screen.

Calculations for 1scale/Saturation Level

An analog to digital converter (ADC) is a very useful feature that converts an analog voltage on a pin to a digital number. Relating ADC value to voltage

1) Less Moisture Condition

a) For analog voltage measured=5V

b) ADC reading= (Resolution of the ADC × analog voltage measured)/System voltage

c) ADC reading= (1023 × 5)/5 = 1023 2)

2) Medium Moisture Condition

a) For analog voltage measured= 3.42V

b)ADC reading= (Resolution of the ADC × analog voltage measured)/System voltage

c) ADC reading= (1023 × 3.42)/5 = 700

3) High Moisture Condition

a) For analog voltage measured= 1.71V

b) ADC reading= (Resolution of the ADC × analog voltage measured)/System voltage

c) ADC reading= (1023 × 1.71)/5 = 350

Selection of Low Level Moisture

When the moisture of soil is low, that is soil is dry the water pump is on and if moisture is high that is soil is wet the water pump is off. The control unit is programmed in such a way that the pump will automatically turn ON if it satisfies the less moisture condition.

For high moisture condition or after fulfilling the required amount of moisture in the soil the pump will turn OFF automatically.

It is found the sensor value for less moisture condition is greater than 700 which means the soil contains less water. After reading this value the controller will automatically drive the water pump. The soil moisture sensor keeps on sending the moisture content of the soil to the controller continuously at a regular interval of time. When the required level of moisture is attained or the sensor output reaches a value less than equal to 350, the pump will turn OFF automatically.

Soil moisture sensor level and output voltage relationship

S. No	**Level**	**Analog Voltage(Volt)**	**Digital Voltage**
1	Low	3	1023
2	Medium	3.42	700
3	High	7.71	350

Advantages and Limitations

Advantages

1. Increase in productivity.

2. Reduced water consumption.

3. Safe handling.

4. Less manpower required.

5. Reduce soil erosion and nutrient leaching.

6. Require smaller water resources.

7. System can be switched into manual mode whenever required.

8. Minimize the infrastructure to store and carry water.

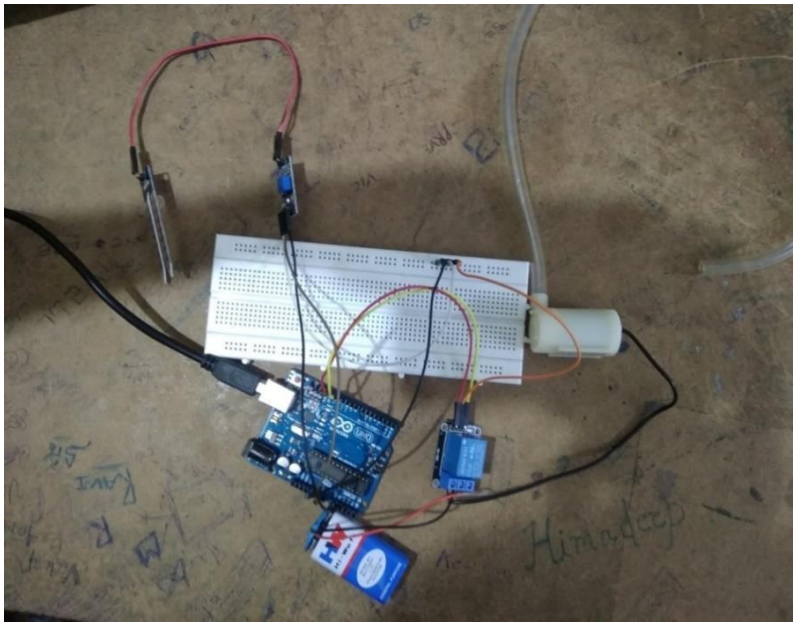
9. Protect the water resources for future generations.

Limitations

1. It lowers the temperature and makes the locality damp due to the presence of irrigation water.

2. Excessive seepage into the ground raises the water-table and this in turn completely saturates the crop root-zone. It causes water logging of that area.

Proposed Concept & Working Principle



Final Testing Working Model

The system was tested for black and red soil under the dry and wet conditions. Using these results a maximum value for the dryness of the soil is set that is 1023 and minimum value is 450.Maximum value is taken as 1023 since the soil moisture sensor can measure value up to this. So, if the measured value by the sensor is between 1023-450 the motor will turn on

automatically and initiates supply of water to the crops. However, if the measured value is less than 450 it implies that the soil is wet and hence the motor remains off and no water is supplied to the crops.

Conclusion

The primary goal of the project is to develop a wearable/handheld device for early warning in the restricted area, displaying various physical parameters like soil moisture in the agricultural field useful for agricultural farmer by wirelessly measuring them. It will also be useful for farmers for getting all information about the environment in a single piece of device which is easily operable by anyone. This system is a reliable communication system without breakdown because of the use of Personal Area Network.

All the data can be read by the smart device without interruption and delay because of the efficient use of communication algorithm in the control node. Employing embedded technology, based on Arduino, the Wireless Sensor Nodes are designed and implemented.

The data received from soil moisture sensors and water level sensors are calibrated against standard instruments and found to be accurate. The RF module Zigbee operated at 2.4GHz ISM band really helps for secure data transmission.

The moisture in percentage is continuously observed on the monitor of the base station. Thus, the control room could get the temperature of different places and the presence/absence of hazardous gases in a particular area and soil moisture content which could be useful to the farmer for having prior information about the environment thereby increasing the yield. The system works with great reliability. The smart phone will receive data from the field through the central node. Hence, this IoT based application in agriculture called smart farming can make a better quality life of farmers particularly in our country where farmers resort to suicides and suicidal attempts because of uncertain climatic condition and natural disasters.

b) Smart Greenhouse

The smart greenhouse is a brain child of our Director, Mr. K. M. Minhajuddin who is an ardent nature lover. His passion and hobby of plantation has resulted in this aspect where a simple green house/ poly house has been transformed to an interdisciplinary area of R&D. It has taken a shape of a distinctive strategy in creating a self-regulating, microclimate suitable for plant

growth through the use of sensors, actuators, monitoring and control systems that optimize growth conditions and automate the growing process.

Our country is expected to witness significant changes due to increasing population, climate change and, urbanization. Based on type, the market can be segmented into hydroponic and non-hydroponic:

- Hydroponic greenhouses grow plants without soil.
- Non-hydroponic smart greenhouses dominate the market and have the highest growth potential over the forecast period.

The key technologies used in the smart greenhouse market are HVAC, LED grow lights, communications technology, irrigation systems, materials handling, valves and pumps, and control systems.

The rapid adoption of technology in emerging economies of Japan, China, and India is expected to drive the smart greenhouse market in Asia Pacific. Asia Pacific is expected to become the most attractive segment due to rapid infrastructure development in countries such as India coupled with a high population.

Smart greenhouse farming is a technique that enhances the yield of crops, vegetables, fruits etc. Greenhouses control environmental parameters in two ways; either through manual intervention or a proportional control mechanism. However, since manual intervention has disadvantages such as production loss, energy loss, and labor cost, these methods are less effective. A smart greenhouse through IoT embedded systems not only monitors intelligently but also controls the climate. Thereby eliminating any need for human-intervention.

Different sensors that measure the environmental parameters according to the plant requirement are used for controlling the environment in a smart greenhouse. Then, a cloud server creates for remotely accessing the system when it connects using IoT.

Internet of Things Applications in Green house

Inside the greenhouse, the cloud server helps in the processing of data and applies a control action. This design provides optimal and cost-effective solutions to the farmers with minimal and almost no manual intervention.

The smart greenhouse state and water consumption can be supervised with these sensors through sending SMS alerts to the farmer with an online portal. The sensors in the IoT system in the greenhouse provide information on temperature, pressure, humidity, light levels.

The students were involved during the construction of the smart greenhouse in our green campus for promoting IoT enabled organic farming. The main aim of this activity was to let the villagers know about the same concept so that they can themselves practice the IoT based agriculture.

The other objective of this interdisciplinary green practice will also help the students if interested to become entrepreneurs in this technologically driven methodology.

Smart Greenhouse at GIET

3. Conclusion

Hence, this IoT based application in agriculture called smart farming can make a better quality life of farmers particularly in our country where farmers resort to suicides and suicidal attempts because of uncertain climatic condition and natural disasters. This technology driven modern strategy can be applicable in the adopted villages under Unnat Bharath Abhiyan in near future.

Unnat Bharat Abhiyan Documents

File No. 5-1/2016-UBA
Ministry of Human Resource Development
Department of Higher Education
UBA Cell

Shastri Bhavan, New Delhi
20th Feb 2018

OFFICE MEMORANDUM

Subject: Unnat Bharat Abhiyan Programme of Government of India

This to convey the approval of Government for implementation of the Unnat Bharat Abhiyan (UBA), aimed to connect the higher educational institutions to the villages around, at a total cost of Rs.83.08 Cr. The scheme shall be implemented through the selected higher educational institutions which adopt villages and through knowledge transfer, would bring overall growth in the rural communities.

Objectives

2. The following are the objectives of UBA:
   a) To engage the faculty and students of Higher Educational Institutions (HEIs) in understanding rural realities.
   b) Identify & select existing innovative technologies, enable customisation of technologies, or devise implementation method for innovative solutions, as required by the people.
   c) To allow HEIs to contribute to devising systems for smooth implementation of various Govt programmes.

3. Strategy

   a) The HEIs will be selected through a challenge method, from both technical and on-technical streams, based on parameters such as – history of engagement with rural communities, adequate faculty, and commitment to the programme objectives.
   b) The selected institutions will work with State Govt, district authorities / PRIs / other institutions and nongovernmental bodies, for arriving at suitable and solutions for improving the social and economic well-being of the rural communities.
   c) The selected HEIs shall meet from their own resources all expenses for the field visits, and any other expense that is not specifically funded under the scheme.
   d) Where technological solution is to be developed or customized to the local requirements, a small grant would be available under the scheme, as recommended by Subject Expert Groups.
   e) Institutions are expected to do field studies, study the implementation of Govt schemes, and facilitate their better implementation so that they meet their objectives best.

4. Selection of institutions:

The following is proposed to be the number of institutions selected for UBA programme in the next three years:

year	Number of technical institutions	Non-technical institutions	Total institutions to be selected
2017-18	250	500	750
2018-19	1000	2000	3000
2019-20	1500	3000	4500

Note: The (170) Institutions which are already participating in UBA would be automatically selected for the first year.
The selected institutions would be intimated to the State Government and the District Magistrates concerned so as to allow easy linking up with the local authorities.

5. Nature of Interventions

The interventions under the UBA can cover various field such as low cost technological solutions covering agriculture/education/health/sanitation/housing, organic/natural farming, Swachh Bharat Abhiyan, drinking water, bioenergy, afforestation, skill development, digital literacy/e-Gram Panchayat etc.

6. Organizational structure:

a) The **National Steering Committee (NSC)** is a body of reputed experts constituted vide MHRD order no. 1-1/2016-UBA dated: 4th April, 2016 and would be apex policy making body. It has representatives from Ministry of HRD, Ministries of Rural Development, Panchayati Raj, D/O Land Resources, Drinking Water & Sanitation and a few other related Ministries/ Departments.

b) The Indian Institute of Technology Delhi will be the **National Coordination Institute (NCI)** for the scheme. The NCI has the overall responsibility in selection, training of institutions, constituting the Subject Expert Groups and monitoring the programme through a web portal. They are accountable for successful implementation of the UBA as per the objectives of the programme.

c) The **Subject Expert Groups** are institutions which have been appointed by the NCI for providing operational expertise sought by the HEIs engaged in the village exercise. They evaluate and approve the technical solutions proposed by the HEIs and monitor the customisation process.

d) **Regional Coordinating Institutes (RCI)** are institutions identified by the NSC for the purpose of better coordination of the programme in specified areas/States.

e) All the selected participating HEIs are expected to establish a **UBA cell** which will be responsible for carrying out the activities of UBA in that institution.

File No. 5-1/2016-UBA

To

1. Secretary, Ministry of Rural Development, Krishi Bhawan, New Delhi
2. Secretary, Ministry of Panchayat Raj, Sardar Patel Bhawan, New Delhi
3. Secretary, Ministry of Drinking Water & Sanitation, Paryavaran Bhawan, CGO
4. Principal Secretaries, Higher Education of all Sates & UTS
5. Principal Secretaries, Rural Development of all States & UTs
6. Director, IIT-Delhi
7. PSO to Secretary (HE), Shastri Bhawan, New Delhi
8. PPS to Special Secretary (HE), Shastri Bhawan, New Delhi
9. All Bureau Heads in Department of Higher Education, MHRD, Shastri Bhawan, New Delhi.
10. Dr. Vijay Bhatkar, Chairman, National Steering Committee, UBA
11. Prof. V.K. Vijay, National Coordinator, UBA

Copy to:

1. PS to Hon'ble Minister, HRD, Shastri Bhawan, New Delhi
2. PS to Hon'ble MoS (SPS), Higher Education, MHRD, Shastri Bhawan, New Delhi
3. Additional Secretary, PMO, (Dr. Tarun Bajaj), South Block, New Delhi

7. Financial allocations:

An amount of Rs. 83.08 Cr would be spent on the programme as per the details enclosed. All funds would be released on the EAT (Expenditure Assessment Transfer) Module.

Financial allocations for UBA

Item	Detail	Allocation (in Rs lakhs)			
		2017-18	2018-19	2019-20	Total
Orientation of the faculty in identification of the projects	InstitutionsX2 facultyX1dayXRs1000	15	60	90	165
Maintenance of the portal by AISHE and IIT Delhi	Rs. 10 lakhs a year	10	10	10	30
Subject Expert Groups (12 groups) –personnel hiring	12 groupsX10 membersX30 daysXRs.5000	180	180	180	540
Assistance for selection of technologies (75, 350 & 700 items cap each year based on demand at village level towards gap in cost only)	Each technology XRs. 1 lakh	75	350	700	1125
Assistance for customisation of solutions (500, 1000 & 1000 villages cap each year)	Each solution X Rs.50,000	250	500	500	1250
Assistance for awareness, GPDP study, need assessment etc. to all technical institutions (cap at 250, 1000 & 1500 institutions X 5 villages each)	Token amount of Rs. 10,000 per village	125	500	750	1375
Assistance for awareness, GPDP study, need assessment etc. to all non-technical institutions (cap at 500, 2000 & 3000 institutions X 5 villages each)	Token amount of Rs. 10,000 per village	250	1000	1500	2750
NCI admin expenses		15	30	45	90
Publicity/sammelans/workshops		50	100	150	300
Evaluation of solutions		28	65	75	168
Swachata Action Plan			240		240
Miscellaneous expenditure		25	100	150	275
Total		**1023**	**3135**	**4150**	**8308**

(This OM replaces the orders issued in earlier OM No. 5-1/2016-UBA dated 18.12.2017)

(N. Saravana Kumar)
Joint Secretary
Tele : 23071486

उन्नत भारत अभियान
Unnat Bharat Abhiyan

WELCOME G. YUGANDHAR REDDY

Please submit your village & household survey data. Please **read the instructions** carefully before you submit the village & household survey data. **Click Here** to go to submit the village & household survey data.

Your Information

Participating Institute	Global Institute Of Engineering & Technology (Id: C-19722)
Name of the Coordinator	G. Yugandhar Reddy
Email	yugandharu6@gmail.com
Mobile no.	9963550252
State	Andhra Pradesh
Districts	Rangareddy
Cluster of Villages	Chandanagar Chilkoor Mothukupalle Yenkapalle Kanakamamidi

उन्नत भारत अभियान
राष्ट्रीय समन्वय संस्थान
भारतीय प्रौद्योगिकी संस्थान दिल्ली
हौज़ खास, नई दिल्ली-११००१६

UNNAT BHARAT ABHIYAN
NATIONAL COORDINATING INSTITUTE
INDIAN INSTITUTE OF TECHNOLOGY DELHI
Hauz Khas, New Delhi - 110016
Website : http://unnat.iitd.ac.in

उन्नत भारत अभियान
UNNAT BHARAT ABHIYAN

Prof. Virendra K. Vijay
National Coordinator, UBA
Professor CRDT, IITD

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vkvijay@rdat.iitd.ac.in

Dear Sir/Madam,

Congratulations to all the Participating Institutions (PIs) selected under Unnat Bharat Abhiyan, a flagship program of Ministry of Human Resource Development (MHRD) Government of India through a challenge mode application. The Mission of Unnat Bharat Abhiyan is to enable participating higher educational institutions to work with the people of rural India in identifying development challenges and evolving appropriate solutions for accelerating sustainable growth. It also aims to create a virtuous cycle between society and an inclusive academic system by providing knowledge and practices for emerging professions and to upgrade the capabilities of both the public and the private sectors in responding to the development needs of rural India.

As per the programme, educational institutions is primarily to develop linkage with selective rural clusters (preferably of five villages), to get involved in the planning process and to promote the requisite S&T interventions to improvise and expedite the developmental efforts in those clusters. The approach is a departure from the grant oriented method and would see the participation and commitment of faculty and students in this endeavour.

We shall be processing release of Rs. 10000/- per village under the UBA program. The funds are mainly meant for assistance for awareness, Gram Panchayat Development Plan (GPDP) study, need assessment, and contingency expenditure. There are provision of Rs 1.0 lakh for technological intervention/ solution and Rs 0.50/- lakh for customization of a technological solution under the program. Which you can avail of afterwards by submitting proposals with ratification of the Gramsabha. A two-way channel between PIs and National Coordinating Institute (NCI) as well as Subject Expert Groups (SEGs) for project proposal submission and evaluation has been developed and functional on UBA portal. You can use your login credential for uploading proposals on UBA website '**FINANCIAL AIDS** '. The login credentials are same as your registration login credentials.

You are also requested to keep IIT Delhi, the National Coordinating Institute updated about your activities so that the same can be uploaded on the website of UBA.

Regards and best wishes for your institution for contributing to India's development.

With regards

Your Sincerely ,

Prof. Virendra K Vijay
National Coordinator,
Unnat Bharat Abhiyan

Gmail

Yugandhar Reddy <yugandharu6@gmail.com>

Welcome Kit and General Guideline of UBA

Unnat Bharat Abhiyan <unnatbharatabhiyaniitd@gmail.com>
To: Unnat Bharat Abhiyan <unnatbharatabhiyaniitd@gmail.com>
Bcc: yugandharu6@gmail.com

Mon, Oct 29, 2018 at 6:24 PM

Dear Sir/ Madam

Congratulations to all the Participating Institutions selected under Unnat Bharat Abhiyan, a flagship program of Ministry of Human Resource Development (MHRD) Government of India through a challenge mode application. We are glad that you have selected the cluster of villages under Unnat Bharat Abhiyan (UBA) in consultation with the District Collectors.

The next step is to complete the survey of all the villages adopted by you under the program. Please find attached a copy of a template for Baseline Household survey form as well as the Village survey form to be filled in during the field survey. Attempt should be made to cover all Households in the village. One Village survey forms is to be filled for each village. Kindly get it completed in all village survey as soon as possible whereas in respects of household survey by the third week of January 2019. Then the data should be uploaded online on the reporting portal of UBA website from your side. The Reporting Portal' login credentials are same as your registration credential, soon the portal will be activated for uploading the data. After login your login credential and uploaded the baseline survey data on UBA Website for further analysis. After final submission of baseline survey data an analysis report of the data, fed by you will be generated on the UBA Website at your Institute page under Reporting Portal on the home page. You may use same for the preparation of plan of action/ Village development plan/ Technologies intervention for each village.

You are requested to complete PRA exercise of adopted villages for identification of major problems and preparation of a plan of action/ technical interventions. You are advised to kindly contact the village development officer and representatives of villages and organize Gramsabha meeting as soon as possible and identify three major issues to be taken up for village development. You can set short term, medium term and long-term goals for a village development. You should start addressing two or three challenging issues immediately without waiting for household surveys to be completed. These issues should be identified through Gram Sabhas and should ensure public participation in planning and implementation. A template for seeking information regarding plan of action for the key problem identified in villages has been developed. A template for seeking information regarding plan of action for the key problem identified in villages will be available soon on the reporting portal to upload your plan of action. Please find attached copy of PRA report for Nuamgabad village (IIT Delhi adopted village) along with PPT of "Development and Demonstration of Participatory GIS for use by Rural Stakeholders in Watershed Development. We have already upload some of village development plan on UBA website, please visit the UBA website for more information.

A tentative time line for its implementation could be as follows.

Item of work	Time from the date of launch
Selection of the Cluster	One month
Awareness generation	Two months

Social mobilization	Three months
Baseline Survey	Three months
Situation analysis	Five months
Village development plan	Seven months
Approvals and sanctions	Eight months
Implementation in the field	Nine months
Progress Review	One Year

You are also requested to keep IIT Delhi, the National Coordinating Institute updated about your activities so that the same can be uploaded on the website of UBA.

Note: Please put up UBA banner in your institute premises so that interested faculty/student can contact for joining UBA programme (copy attached S.No.-11)

Regards and best wishes for your institution for contributing to India's development.

Encl:

1. Congratulation letter from IIT Delhi
2. Link of UBA Booklet (http://unnat.iitd.ac.in/app/webroot/files/brochure.pdf
3. MHRD new circular for UBA 2.0
4. MHRD letter to DC
5. How to prepare plan of action
6. Participatory GIS PPT
7. VDP IIT Delhi
8. Village survey form
9. Household survey form
10. SAGY Guidelines.
11. UBA banner for PIs to be put up at a prominent place in your institution.
12. SEG details
13. Guideline for fund utilization

With Regards,

Dr Virendra K Vijay

National Coordinator - Unnat Bharat Abhiyan

IREDA Chair Professor & Head

Centre for Rural Development and Technology,

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