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INTERNET OF THINGS
COE MOU
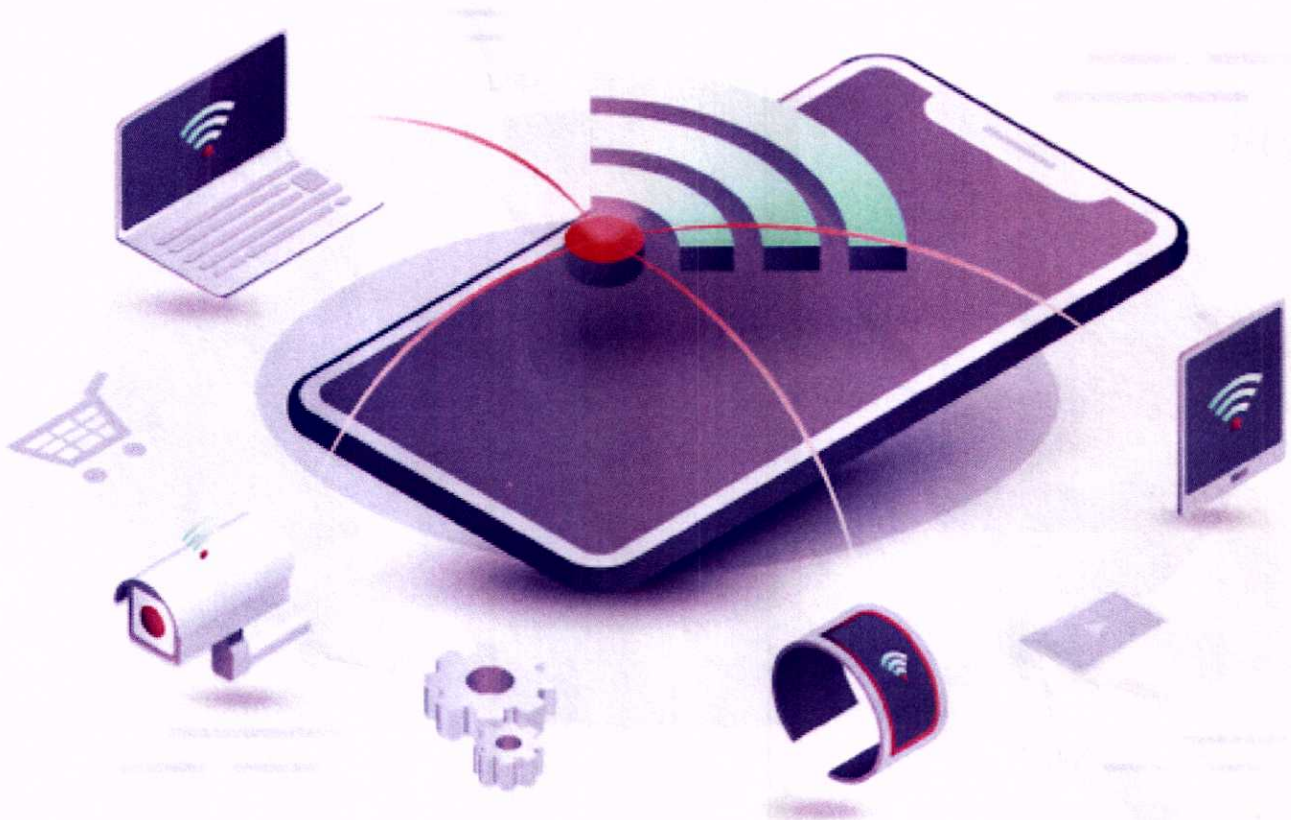
Prepared for GLA UNIVERSITY, Mathura, Uttar Pradesh, India

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Proposal Reference:

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Confidentiality and Copyright Notice:

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Table of Contents:

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INTRODUCTION

The Internet of Things (IoT) has evolved into a new era of innovation. Things are becoming smarter through the convergence of the digital and physical worlds. Researchers estimate that by 2025, the number of active wireless connected devices will reach 75.4 billion.

The explosive growth of the "Internet of Things" is changing our world, and the rapid drop in price for typical IoT components is allowing people to innovate new designs and products. In this lab, you will learn the importance of the IoT in society, the current components of typical IoT devices, and trends for the future. IoT design considerations, constraints, and interfacing between the physical world and your device will also be covered. You will learn how to make design trade-offs between hardware and software. We'll cover key components of networking and suggest projects to ensure that students understand how to connect their device to the Internet (Faculty can also learn about cyber security, machine learning etc with the help of our IoT Kit).

ABOUT COE

This is a proposal to set up a Center of Excellence for the Internet of Things (IoT) at GLA UNIVERSITY, Mathura, Uttar Pradesh, India. The vision of the laboratory is to enable educational institutes in India and outside to collaborate and make this lab an innovation hub in the emerging technology of Internet of Things through democratization of innovation, standardization, realization of prototypes and products before deployment of the IoT devices in the public domain/infrastructure and support initiatives on IoT solutions for specific needs in areas like water, energy, agriculture, health, security etc.

The main goal of setting up an innovation center in your institution is so that your students have exposure to and gain industry-standard knowledge of IoT technologies.

OBJECTIVES

- ❖ To create innovative applications and domain capability across verticals for needs such as Smart Cities, Smart Health, Smart Manufacturing, Smart Agriculture and various other applications.
- ❖ To build industry-capable talent straight out of graduation so that they are industry ready, and also to support the start-up community and entrepreneurial ecosystem for IoT.
- ❖ To provide an ecosystem for innovation to thrive and embrace entrepreneurship.
- ❖ To energize the research mindset and reduce costs in research and development by providing neutral and interoperable multi-technology stack laboratory facilities.
- ❖ To position Indian academia as a provider of end-to-end solutions in the engineering space.
- ❖ To provide an environment for product creation, testing and for validation and incubation
- ❖ Democratization of IoT Innovations through incubation on multi-platform Technology Labs for - Concept validation to product or solution realization.
- ❖ Development of an IoT ecosystem with the collective capacity of stakeholders.
- ❖ The vision of creating an IoT innovation hub and a Centre of Excellence in collaboration with us

Ashok Kumar Singh
Registrar
GLA University

ADVANTAGES OF A IOT LABORATORY

Stakeholders	Advantages
Institute	• The Institute can become a pioneer for IOT technology and IOT education for engineers in the region and conduct advanced projects.
Academia	• Availability of a technology lab for faculty/researchers • Industry standard proficiency courses for upgrading skills • Platform for offering special courses / consulting projects
MNCs	• "Risk free" demand technology lab • On-demand proficiency center for skill up- gradation • Access to industry-ready talent, technical experts, and consultants
Industry	• Trained manpower • Innovative Ideas • Prototypes for new products • Students/job seekers • Internships on IoT projects • Access to Industry experts/ courses / showcase of talent

LIST OF PROJECTS

- Line following + Obstacle avoidance mobile robot
- Bluetooth controlled: Mobile robot + Home automation
- Automated sorting system based on color
- IoT enabled smart irrigation system
- IoT enabled LPG and butane gas detector
- IoT enabled altitude, pressure and temperature acquisition system
- IoT enabled patient monitoring system
- IoT enabled water quality monitoring system with water level detection
- IoT enabled object tracker + theft monitoring system
- Weather monitoring system using XBEE
- IoT enabled data acquisition system
- Raspberry Pi based mobile robot
- RPi based home automation using Google Firebase
- RPi based smart parking management system
- Raspberry Pi with AZURE IoT - Telemetry data transmission

And many more real-time projects.

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SERVICES WE PROVIDE

Particulars	Details
Services	- Site inspection and planning - Design proposal as per Site Condition - Services Coordination - Deployment of IoT Lab - Installation of Lab system with racking system - Training and Training Material via our LMS portal - Structured wiring and cabling (power and network) - Lab Design and Stickers
ERA's IoT Research Kit	Devices and Components (500+ devices)
Training	1 week full fledged of training to the faculty online (respected to COVID situations*) - Two days of offsite training to the faculty at the , Bangalore Office (limited to five faculty nominated by college) (subjected to changes with COVID situations*) - LMS training every 2 months (first 1 year) - Quarterly review meeting between college and nominated faculty for tracking utilization of the laboratory facility & progress of students - One-day on-campus workshop/make-a-thon on IoT by industry experts. - End to end documentation
Action Plan (Post Implementation & Setup of Laboratory)	- Phase 1 – First three months – Training and Execution of Basic Projects - Phase 2 – 12 months – Execution of Experiments and Projects on IoT

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ERA interfaces

LAB KIT WITH TURNKEY SERVICES - BILL OF MATERIAL

Sl. No	Item Descriptions	Quantity	Type
1	Site Inspection and Details		
2	Design proposal as per Site Condition and Services Coordination		
3	Design and Stickers		
4	Execution of Project and Professional Services		
Computer Infrastructure			
5	**Device Storage** *(Optional)* Includes component storage boxes, tables & other infrastructure for hardware, computers		
Devices & Components			
8	Projects Kit (10 Tables-50 students batch included)	10	One Time
Software & Training			
9	Simulation Programs and Projects (LMS) Access	1	Yearly
10	1 Week Students/ Faculty Bootcamp Session	1	Yearly

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IoT DEVELOPMENT KIT

ERA's IoT Development Kit (50 Students Batch Size)
Transparent Robot Smart Car Chassis with wheels and motors
L298N Motor driver
9V HW Battery with connector
PC817 Optocouplers
Resistor pack - 1/4Watt { Mix }
Jumper wire set { Mix }
LEDs
16x2 LCD display with I2C
Ultrasonic sensor
Servo motor SG90
Soil moisture sensor
IR sensor
Multimeter
Soldering Iron Kit
Screwdriver set
LDR
Rain sensor module
Neo 6M GPS
DC motor
Wire stripper
Heart rate sensor

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TERMS & CONDITIONS

Shipping/Delivery Policies:

❖ Shippings are through reputed courier agencies for ensuring fast delivery and good condition of goods.

❖ The particulars/components will be delivered within 3 - 4 weeks from the date of your confirmation.

❖ The shipping time may get delayed due to the high demand for semiconductors and shortages of particulars/components.

Warranty Policies:

❖ ERAINTERFACES provides one-time replacement of the particulars/components in case of any damage during shipping.

❖ ERAINTERFACES provides a standard warranty of a minimum of 15 days [unless otherwise specified in the product case/box/manual].

❖ Note: No warranty will apply if the particular/component has been modified, misused, soldered, altered, or subjected to any accidents.

❖ Claiming an exchange or return claims of the particular/component without valid test proof leads to rejection of the request.

FDP/LMS policies:

❖ The respective Institute/Individual should arrange travel and accommodation for the faculty member/members attending the IoT Faculty Development Program at ERAINTERFACES's office campus.

❖ Institute/University/Individual shall not be authorized to share, copy, or distribute any particulars/components/course materials/LMS outside its/their organization without prior knowledge of the company.

Safety and Infrastructure Policies:

❖ ERAINTERFACES is not responsible for any personal injuries/damages caused to an individual/organization during the experiment, sessions, or courses.

❖ Lockable space for storing and organizing the particulars/components should be arranged and maintained by the Institute/University.

❖ Computer infrastructure of the base configuration specified by ERAINTERFACES is mandatory for running the laboratory successfully.

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ACCEPTANCE OF COE

Internet of Things – Laboratory

Institution Representative

Name:

Designation:

Sign and Stamp: **Ashok Kumar Singh**
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Representative: Akash Vellore

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ANNEXURE

This section provides brief introduction about the devices we provide in the ERA's IoT development kit

SENSORS

Introduction

The Internet of Things (IoT) is about interconnecting embedded systems, bringing together two evolving technologies: wireless connectivity and sensors. These connected embedded systems are independent microcontroller-based computers that use sensors to collect data. These IoT systems are connected together usually by a wireless protocol such as WiFi, Bluetooth, 802.11.4, or a custom communication system. The networking protocol is selected based on the distribution of nodes and the amount of data to be collected.

Below is the list of sensors that are included in the kit.

Temperature Sensor

The Temperature Sensor is precision IC with its output proportional to the temperature (in oC). The sensor circuitry is sealed; therefore it's not subjected to oxidation and other proces
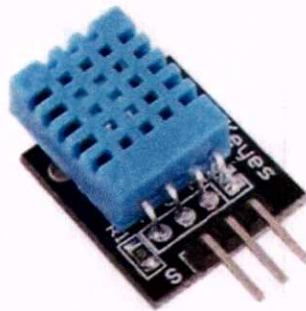

Figure 1.1: Temperature Sensor

Pressure Sensor

This sensor is great for all sorts of weather sensing and can even be used in both I2C and SPI!

This precision sensor from Bosch is the best low-cost, precision sensing solution for measuring barometric pressure with ±1 hPa absolute accuracy, and temperature with ±1.0°C accuracy. Because pressure changes with altitude, and the pressure measurements are so good, you can also use it as an altimeter with ±1 meter accuracy.

Figure 1.2: Pressure Sensor

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LDR Sensors

The Photoresistor is a two-terminal semiconductor device that has an electrical resistance that depends on the light incident on the exposed semiconductor surface, and works on the principle of photoconductivity. The passive component is basically a resistor whose resistance value decreases when the intensity of light decreases.

This optoelectronic device is mostly used in light varying sensor circuits, and light and dark activated switching circuits. Some of its applications include camera light meters, street lights, clock radios, light beam alarms, reflective smoke alarms, and outdoor clocks.
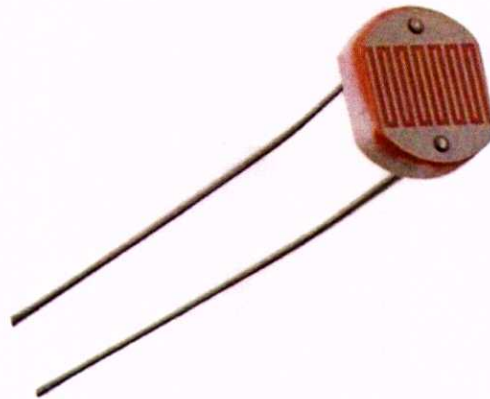
Figure 1.3: LDR Sensor

IR Sensor

An infrared (IR) sensor is an electronic device that measures and detects infrared radiation in its surrounding environment. Infrared radiation was accidentally discovered by an astronomer named William Herchel in 1800. While measuring the temperature of each color of light (separated by a prism), he noticed that the temperature just beyond the red light was highest. IR is invisible to the human eye, as its wavelength is longer than that of visible light (though it is still on the same electromagnetic spectrum).
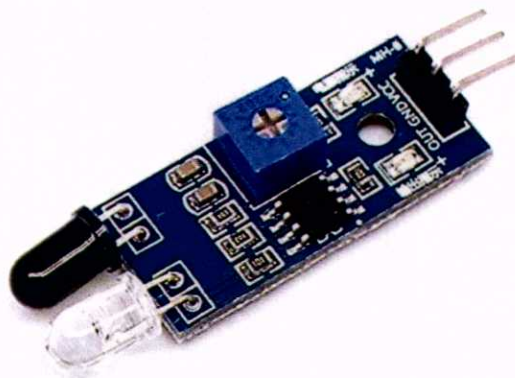
Figure 1.4: IR Sensor

Moisture Sensor

The Moisture Sensor measures the water content in soil. A soil moisture probe is made up of multiple soil moisture sensors. This Soil Moisture Sensor can be used to detect the moisture of soil
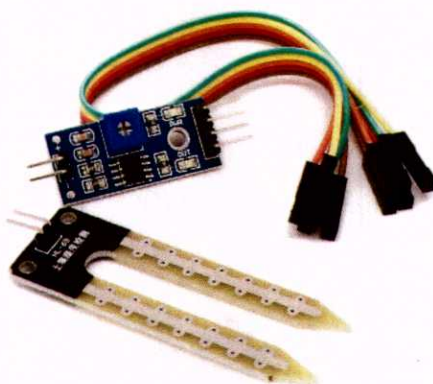

Figure2.6: Moisture Sensor

Motion Sensor

The Motion Sensor (PIR – Passive Infrared) allows you to sense motion, almost always used to detect whether a human has moved in or out of the sensor's range. They are small, inexpensive, low-power, and easy to use
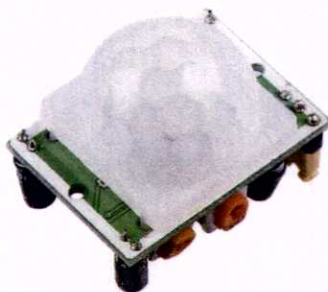

Figure2.9: Motion Sensor

Smoke Sensor

Gas sensor module with a very High detection range compared to any ordinary gas sensor then this MQ-2 Smoke LPG Butane Hydrogen Gas Sensor Detector Module will fulfill your specification demands. The MQ-2 Gas sensor detector module has a detection range of 300-10000 ppm. T

The gas sensor modules are always well known for their robust and simple construction and measures toxic gases in very low concentrations.

MQ-2 gas sensor using gas sensitive material is to clean air in the lower conductivity of stannic Oxide or tin oxide (SnO2). When the sensor when flammable gases are present in the environment in which the conductivity of the sensor with an increasing concentration of combustible gas in the air increases.
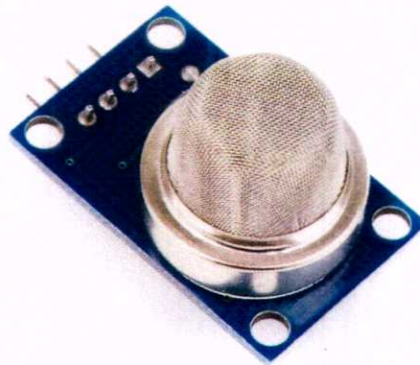
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Figure2.13: Smoke Sensor

Ultrasonic Sensor

The Ultrasonic Sensor provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm.
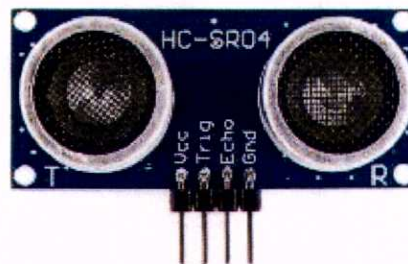

Figure 2.14: Ultrasonic Sensor

MODULES & DEVELOPMENT BOARDS

Arduino UNO

The UNO is the best board to get started with electronics and coding. If this is your first experience tinkering with the platform, the UNO is the most robust board you can start playing with. The UNO is the most used and documented board of the whole Arduino family.

Arduino UNO is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.
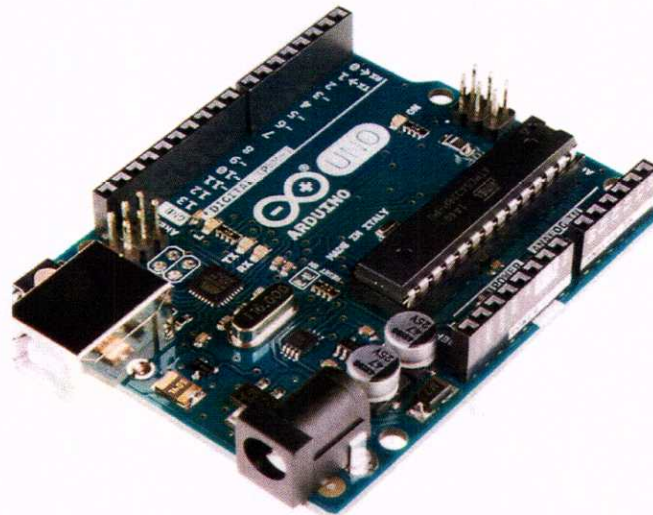
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Figure1.1: Arduino Uno

Raspberry Pi 4

The Raspberry Pi 4 Model B is the latest product in the popular Raspberry Pi range of single board computers. It offers ground-breaking increases in processor speed, multimedia performance, memory, and connectivity compared to the prior generation Raspberry Pi 3 Model B+ while retaining backward compatibility and similar power consumption. For the end user, Raspberry Pi 4 Model B provides desktop performance comparable to entry-level x86 PC systems.
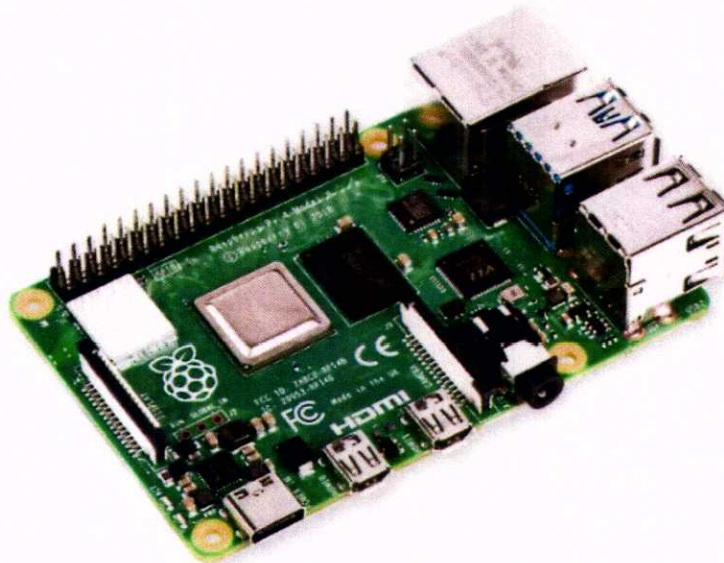

Figure1.2: Raspberry Pi 4 Model B

Node MCU

The NodeMCU is an open source development board and firmware based on the widely used ESP8266 -12E WiFi module. It allows you to program the ESP8266 WiFi module with the simple and powerful LUA programming language or Arduino IDE.

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With just a few lines of code you can establish a WiFi connection and define input/output pins according to your needs exactly like an arduino, turning your ESP8266 into a web server and a lot more. It is the WiFi equivalent of the ethernet module. Now you have an internet of things (iot) real tool.

With its USB-TTL , the nodeMCU Dev board supports directly flashing from the USB port. It combines features of WIFI access point and station + microcontroller. These features   make the NodeMCU extremely powerful tool for Wifi networking. It can be used as an access point and/or station, host a webserver or connect to the internet to fetch or upload data.
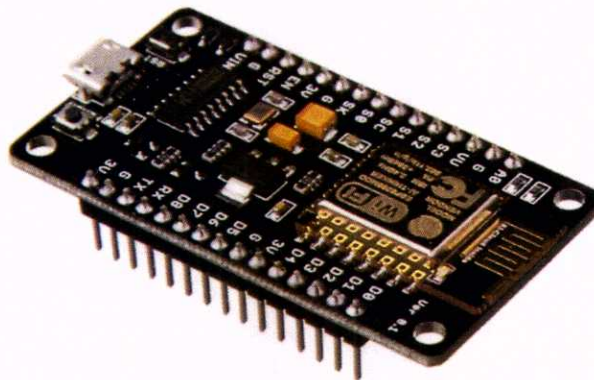

Figure1.3: NodeMCU

NEO-M8N GPS module

NEO-M8N GPS Module is optimized for cost-sensitive applications, while NEO-M8N/M8Q provides the best performance and easier RF integration. The NEO-M8N offers high performance also at low power consumption levels. The futureproof NEO-M8N includes an internal Flash that allows future firmware updates. This makes NEO-M8N perfectly suited to industrial and automotive applications.

The NEO-M8 series of concurrent GNSS modules are built on the high performing M8 GNSS engine in the industry proven NEO form factor.NEO-M8N provides the best performance and easier RF integration. The NEO-M8N offers high performance also at low power consumption levels. The future-proof NEO-M8N includes an internal Flash that allows future firmware updates. This makes NEO-M8N perfectly suited to industrial and automotive applications.
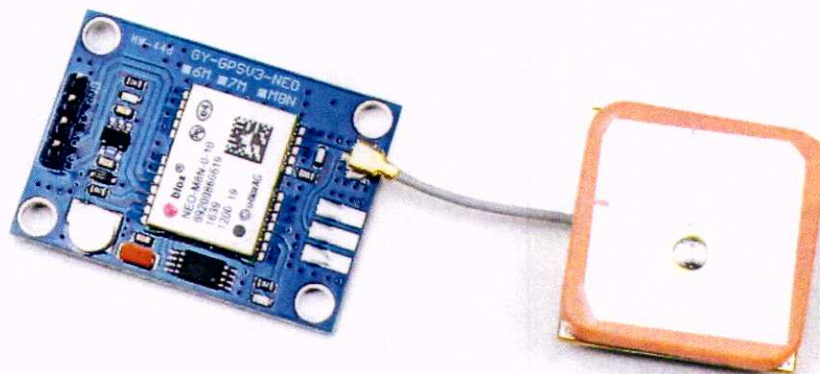

Figure 1.4: NEO-M8N GPS module with ceramic patch antenna