SE Project Review 1(Semester 4)

Vivekanand Education Society's Institute of Technology

Electronics and Telecommunication Engineering

Title of Project: Energy Monitoring System Using Arduino And Raspberry Pi

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Group No. : B8

Students Name- Roll Numbers(Class name)

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3)Hritika Mulay 28 D9B

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Contents to be covered

- Problem Statement
- Proposed Solution
- Literature Survey
- Competitions / Research Gaps
- Complete Block Diagram of Proposed System
- Circuit diagram
- Components requirement
- Time Chart
- Publication oriented/Patent oriented/National level Competition oriented
- References

Problem Statement

With electricity consumption increasing everyday in our homes, we need to be mindful of our energy consumption. Our energy bills reflect the total energy consumption but it becomes difficult to guess which appliance is consuming most energy. Conventional energy meters are offline devices and readings are taken manually and There are not many devices in market that can monitor energy consumption of individual appliances.

Proposed Solution

- Energy monitoring system will monitor and display energy consumption of individual appliances, which will give an insight into which device may be faulty and consuming more energy than it should.

- This project will ease the process of taking readings manually and increase billing efficiency, and will enable the electricity supply authority to read the meter regularly without physically visiting each house. On the other hand, the billing system will become more transparent to the consumer.

Literature Survey

Sr No	Title of the Technical paper	Name of the Author	Year	Name of Journal	Methodology	Results / Conclusion	Drawbacks / Limitations
1.	Design and Implementation of IoT Based Smart Energy Meter [1]	Saikat Saha,Swagata Mondal,Anindya Saha, P. Purkait	2018	Applied Signal Processing Conference (ASPCON)	The raw values of voltage and current are measured through ADC port of the Arduino to count the number of digital samples collected within specified timeout.The samples once collected need to undergo a sequence of mathematical processing to display the readings.	The present reports fabrication and implementation of a smart energy meter, which utilizes the features of embedded systems. Arduino microcontroller with Wi-Fi modem have been used to introduce 'Smart' feature in a traditional domestic energy meter.	This has made power system networks vulnerable to various forms cyber-attacks that have caused major concerns.
2.	IoT Based Smart Energy Monitoring [2]	Abhiraj Prashant Hiwale, Deepak Sudam Gaikwad, Akshay Ashok Dongare, Prathmesh Chandrakant Mhatre	2018	International Research Journal of Engineering and Technology (IRJET)	The system can be structurally differentiated into three parts. The controller performs the basic calculations and processes the information. Theft detection circuit provides information about any extra or theft load energy reading and the most important role is played by the Wi-Fi unit to send the information from the controller over the Internet.	In the proposed project current sensor is used to sense the current and display it on internet using IoT. The system updates the information in every 1 to 2 seconds on the internet using public cloud THINGSPEAK.	If an error occurs in the system, the value in the central server takes time to update.

Literature Survey

Sr No	Title of the Technical paper	Name of the Author	Year	Name of Journal	Methodology	Results / Conclusion	Drawbacks / Limitations
3.	Design And Implementation Of IOT Based Smart Power Monitoring And Management System Using WSNs [3]	IM Nayyef, AA Husein	2018	International Journal of Embedded Systems and Applications (IJESA)	The proposed system is consisted of three parts: smartphone application, base station, and sensing node. Starting from the bottom, the sensing node uses a hall-effect based AC Current sensor and a transformer based AC voltage sensor with Arduino Uno microcontroller to calculate the real-time power consuming of connected electrical appliances.	The proposed system is consisted of three parts: smartphone application, base station, and sensing node. Starting from the bottom, the sensing node uses a hall-effect based AC Current sensor and a transformer based AC voltage sensor with Arduino Uno microcontroller to calculate the real-time power consuming of connected electrical appliances.	This prototype is not yet adaptable to institute, schools, colleges, companies etc.

Comparison/Competition in the Market

- Government of India has already launched initiatives such as Smart Meter National Programme that aims to replace 25 crores (250 million) conventional meters with smart meters in India. Additionally, state governments in the country are investing in boosting smart meter adoption state-wise.
- Global Smart energy meter market size is about 16 billion USD and is expected to grow at a CAGR of 5.5% in next 5 years. There are some smart energy meter manufacturers but most Indian households still use traditional energy meters.

Block Diagram for Arduino Model

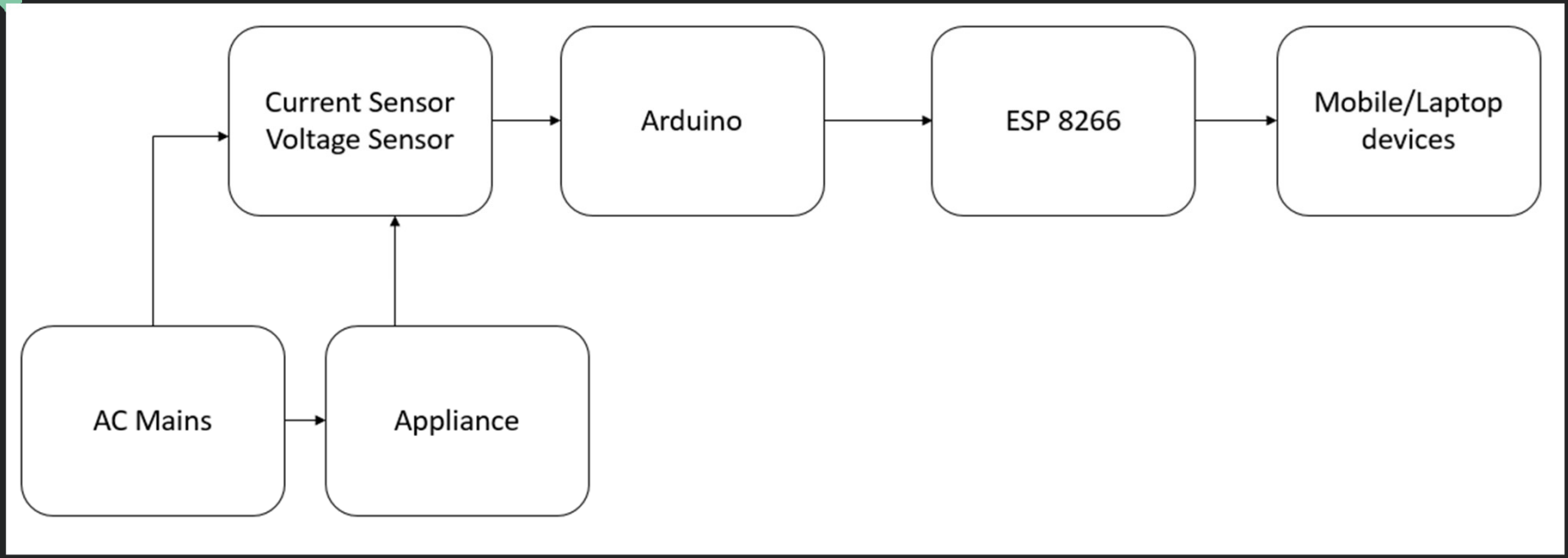


Fig 1. Block Diagram of Energy monitoring system using Arduino and ESP32

Block Diagram for RaspberryPi

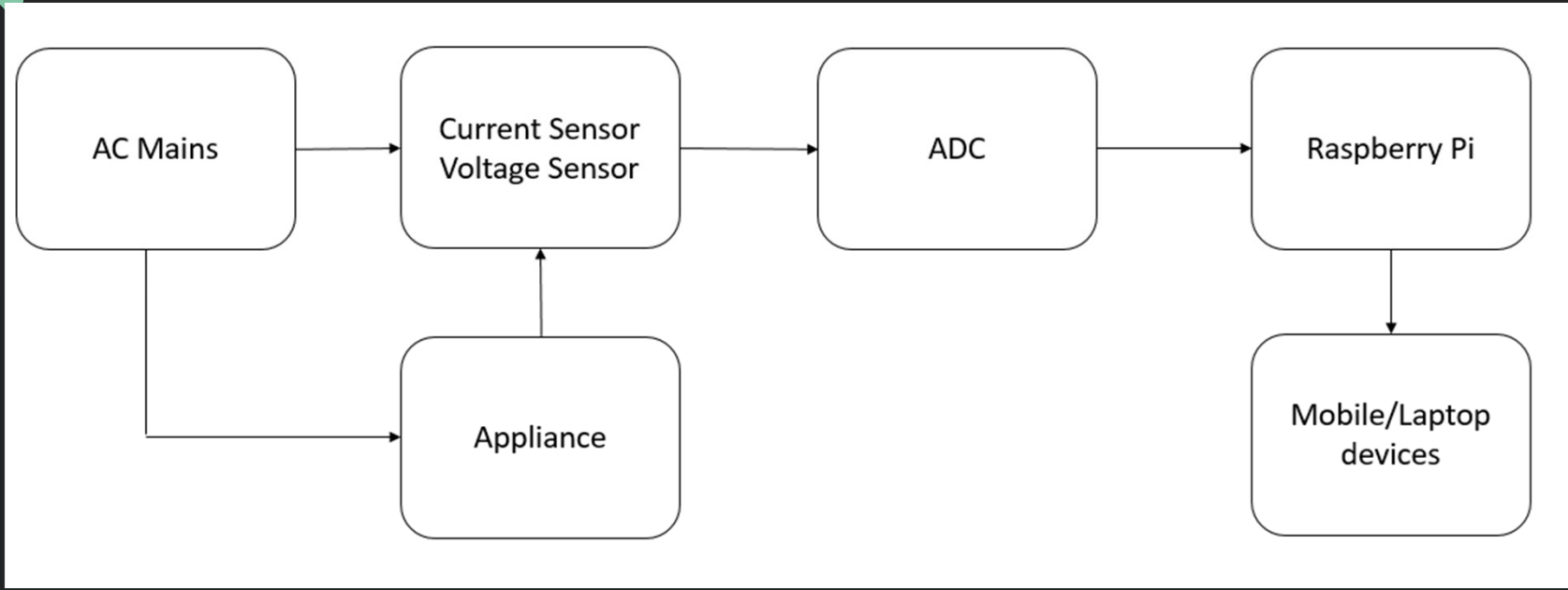


Fig 1. Block Diagram of Energy monitoring system using RaspberryPi

Circuit Diagram

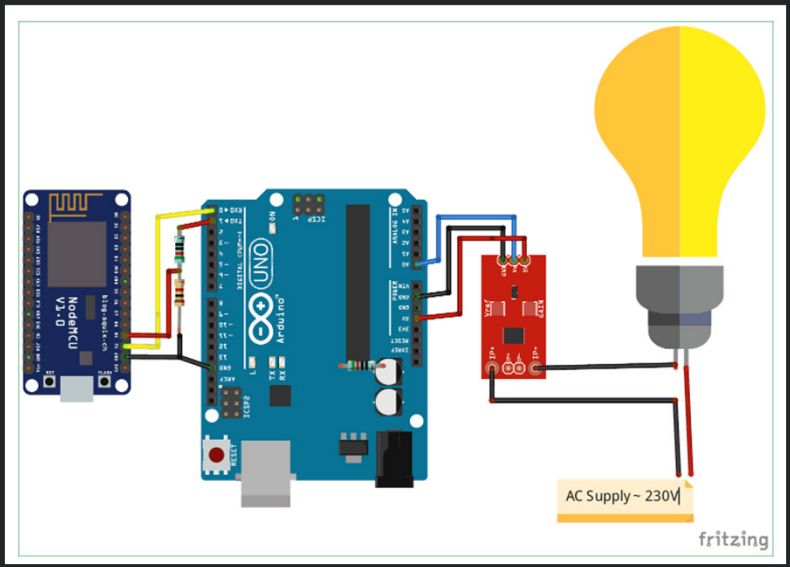


Fig 2. Circuit Diagram for Arduino Model

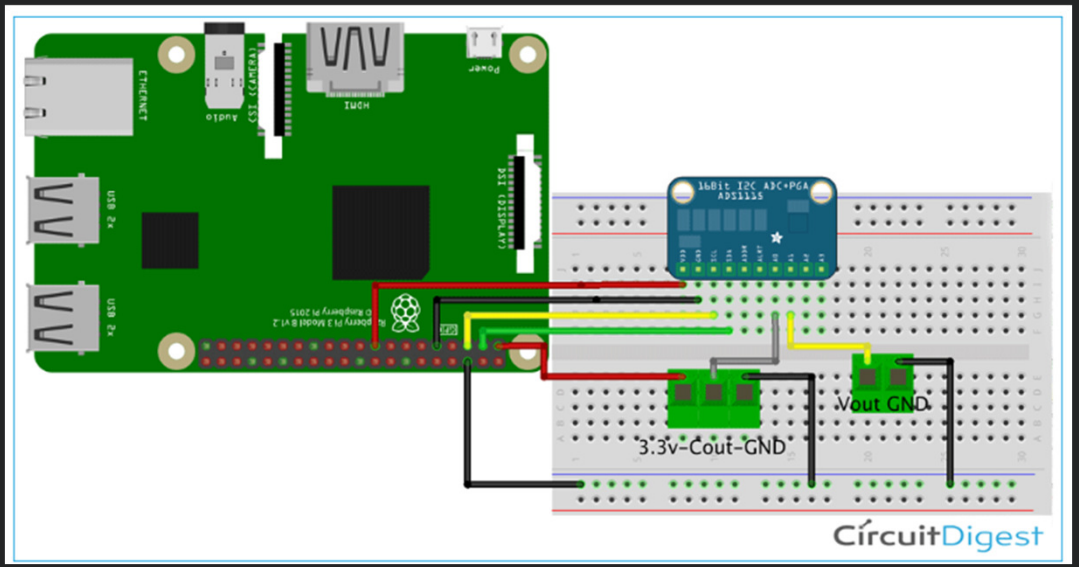


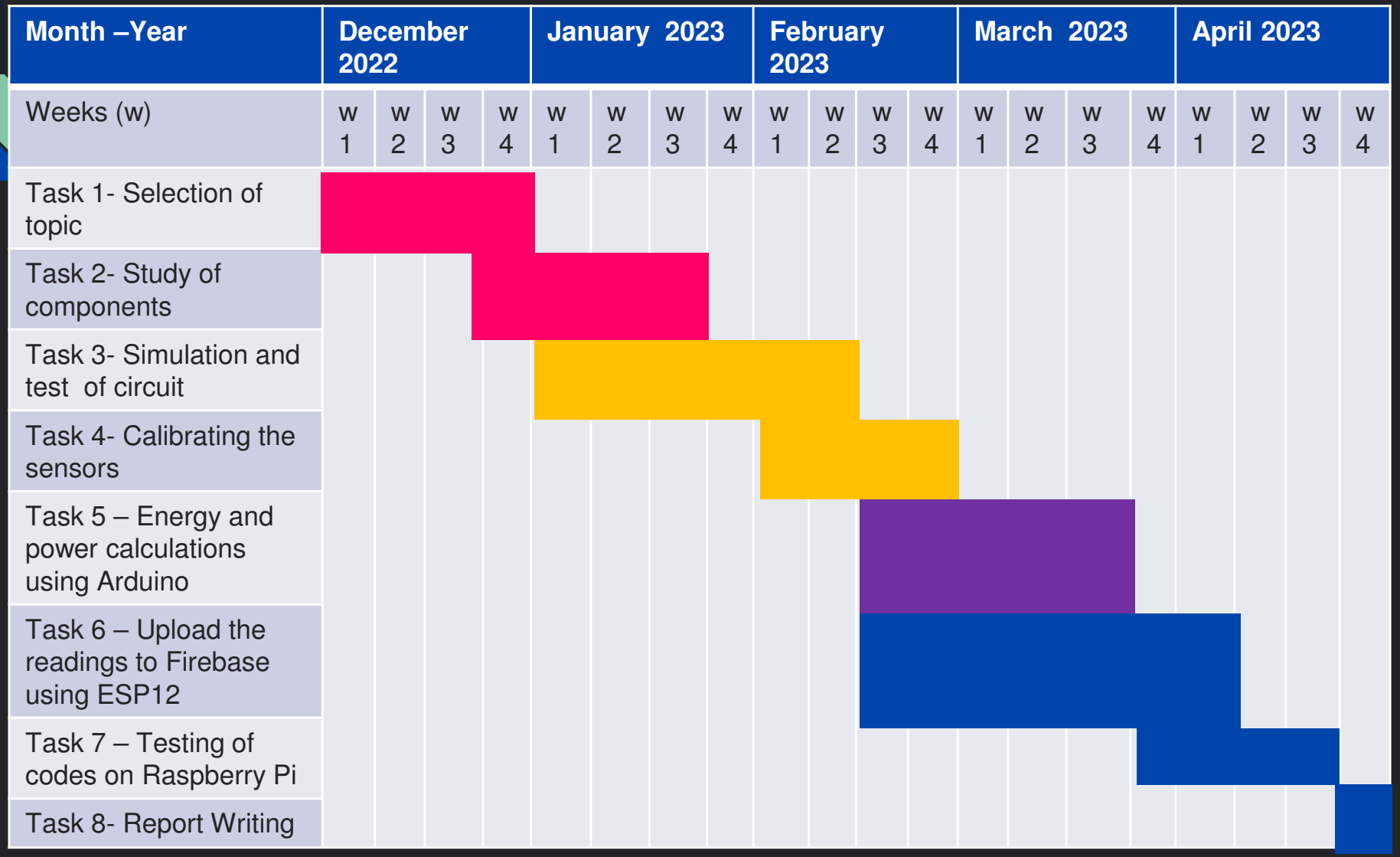
Fig 3. Circuit Diagram for Raspberry pi Model

Components Required for Arduino Model

	Name Of Component	Quantity	Cost In Rupees	References(datasheet)
1.	Arduino UNO	1	400	https://docs.arduino.cc/resources/datasheets/A000066-datasheet.pdf
2.	ESP12F/8266	1	107	https://datasheetspdf.com/pdf/1031464/ETC/ZMPT101B/1
3.	ZMPT101B sensor	1	120	https://www.alldatasheet.com/view.jsp?Searchword=Esp32%20datasheet
4.	ACS712 Sensor	1	120	https://datasheetspdf.com/pdf/570845/AllegroMicroSystems/ACS712/1
	Total		747/-	

Components Required for RaspPi Model

	Name Of Component	Quantity	Cost In Rupees	References(datasheet)
1.	RaspberryPi Zero W	1	4499	https://docs.arduino.cc/resources/datasheets/A000066-datasheet.pdf
2.	ADC Converter IC	1	100	https://datasheetspdf.com/pdf/1031464/ETC/ZMPT101B/1
3.	ZMPT101B sensor	1	120	https://www.alldatasheet.com/view.jsp?Searchword=Esp32%20datasheet
4.	ACS712 Sensor	1	120	https://datasheetspdf.com/pdf/570845/AllegroMicroSystems/ACS712/1
	Total		4839/-	


Month –Year
December 2022
January 2023
February 2023
March 2023
April 2023
Weeks (w)
w 1
w 2
w 3
w 4
Task 1- Selection of topic
Task 2- Study of components
Task 3- Simulation and test of circuit
Task 4- Calibrating the sensors
Task 5 – Energy and power calculations using Arduino
Task 6 – Upload the readings to Firebase using ESP12
Task 7 – Testing of codes on Raspberry Pi
Task 8- Report Writing

References

[1]. Saha, S., Mondal, S., Saha, A., & Purkait, P. (2018, December). Design and implementation of IoT based smart energy meter. In *2018 IEEE Applied Signal Processing Conference (ASPCON)* (pp. 19-23). IEEE.

[2]. Hiwale, A. P., Gaikwad, D. S., Dongare, A. A., & Mhatre, P. C. (2018). IoT based smart energy monitoring. *International Research Journal of Engineering and Technology (IRJET)*

[3]. Nayyef, I. M., & Husein, A. A. (2018). Design and implementation of IoT based smart power monitoring and management system using WSNS. International Journal of Embedded Systems and Applications (IJESA), 8(4), 1-16.

THANK YOU