American International University – Bangladesh (AIUB)

Faculty of Engineering

Department of CSE, EEE, and CoE

EEE4103 MICROPROCESSOR AND EMBEDDED SYSTEM

COURSE CAPSTONE PROJECT PROPOSAL FORM

SEMESTER: Fall 2024-2025
PROJECT TITLE: 2 MARKS (must be an embedded system designed using Arduino/STM32/Raspberry Pi with other necessary sensors, actuators, components, etc. Both hardware implementation and simulation must be shown by the end of the semester. However, the proposal form should be submitted within the next two weeks from now on.)
SURVEY: (to develop a process for complex engineering problems considering cultural and societal factors (use Google or Microsoft Forms to design questions, show the outcomes in the form of pie/bar chart, show the links of questions, minimum 10 questions, and 40 respondents) 8 MARKS
AIMS AND OBJECTIVES OF THE PROJECT: 3 MARKS (there must be a minimum of three aims and objectives of your work using measurable action verbs of Bloom's Taxonomy, for example, design, simulate, implement, analyze, etc.)
LITERATURE REVIEW: (must be related to embedded system design with other necessary citations from the most recently published papers. At least 5 most recent publications must be collected, studied, identified the problems, and then discussed in this section) 5 MARKS
EXPERIMENTAL BLOCK DIAGRAM: (demonstrate how this project is inter-connected with various components and how various signals flow among them using text boxes and arrows) 4 MARKS
POSSIBLE OUTCOMES OF THE PROJECT: 4 MARKS (describe how this project can help the society and improve culture of the society).
PROJECT TIMELINE (GANTT CHART): describe how this project will progress with time by breaking the whole task into several components concerning some specific time using a horizontal or a vertical bar graph) 5 MARKS
REFERENCES: (only published paper-based references are allowed with the IEEE format, don't use YouTube links, Wikipedia, or any random websites for references,): 2 MARKS

Instructions:

There is no definite format to write the proposal, but students must follow the mentioned instructions properly.
Fill in the form accurately with all necessary information.
Make a color print of this form.
Figures, tables, charts, circuit diagrams, block diagrams, and wave shapes must be color printed.
Survey form link must be provided in the proposal form with the answers.

COURSE TEACHER'S NAME **COURSE TEACHER'S SIGNATURE** **DATE**

GROUP MEMBERS

(Maximum 7 students are permitted to carry out a single Project. However, depending on the capability of the students, 4 students may be allowed but not less than that)

NAME: MD. Abdul Aziz **ID #:** 22-47013-1 **PROGRAM:** CSE **EMAIL:** 22-47013-1@student.aiub.edu	**NAME**: Shajid, Md. Shahriar Chy **ID #:** 22-46645-1 **PROGRAM:** CSE **EMAIL:** 22-46645-1@student.aiub.edu
NAME: Gulam Kibria **ID #:** 22-46640-1 **PROGRAM:** CSE **EMAIL:** 22-46640-1@student.aiub.edu	**NAME**: MD. Shafin Islam **ID #:**22-47005-1 **PROGRAM:** CSE **EMAIL:** 22-47005-1@student.aiub.edu
NAME: Tahasin Rana **ID #:** 22-47931-2 **PROGRAM:** CSE **EMAIL:** 22-47931-2@student.aiub.edu	

REMARKS (for OFFICE use only)

Course Name:	Microprocessor and Embedded System	**Course Code:**	COE 3104
Semester:	Fall 2024-2025	**Sec: M**	
Faculty Member:	TAHSEEN ASMA MEEM		

Capstone Project Title:	**CAR PARKING SYSTEM**
Project Group No.	01

Sl #	Student ID #	Student Name	Obtained Marks
1.	MD. Abdul Aziz	22-47013-1	
2.	Gulam Kibria	22-46640-1	
3.	Shajid, Md. Shahriar Chy	22-46645-1	
4.	MD. Shafin Islam	22-47005-1	
5.	Tahasin Rana	22-47931-2	

Assessment Materials and Marks Allocation:

COs	Assessment Materials	POIs	Marks
CO3	Course Capstone Proposal Form	P.c.2.C6	30

Assessment Rubrics:

KPIs	Excellent [2]	Proficient [1.5]	Good [1]	Acceptable [0.5]	Unacceptable [0]	No Response [0]	Secured Marks
Project Title	The title reflects an issue related to complex engineering problems showing targets and methods with possible outcomes.	The title reflects an issue related to complex engineering problems showing targets and methods but some missing issues.	The title reflects an issue related to the course capstone project but there may be some missing issues.	The title reflects an issue related to the course capstone project but is not complete or specific.	The title does not reflect any issues related to the course capstone project.	No Response at all/ copied from others /identical submissions with gross errors/ image file printed	
Comments						**Total Marks (2)**	

KPIs	Excellent [5]	Proficient [4]	Good [3]	Acceptable [2]	Unacceptable [1]	No Response [0]	Secured Marks
Survey	The survey developed as a process for complex engineering problems considering cultural and societal factors has superior variables, targets, measures, and the implementation process is clear and challenging for future project implementation	The survey developed as a process for complex engineering problems considering cultural and societal factors has good variables, targets, measures, and the implementation process is clear and challenging for future	The survey developed as a process for complex engineering problems considering cultural and societal factors has moderate variables, targets, measures, and the implementation process is clear and challenging for future	The survey developed as a process for complex engineering problems considering cultural and societal factors has good variables, targets, measures, and the implementation process is somewhat clear for future project	The survey developed as a process for complex engineering problems considering cultural and societal factors has poor variables, targets, measures, and the implementation process is very unclear for future project	No Response at all/ copied from others /identical submissions with gross errors/	
	with several possible outcomes having good impacts.	project implementation with some possible outcomes with little impact.	project implementation with a few possible outcomes with impacts.	implementation with very few possible outcomes with little impact.	implementation with a few possible outcomes but no impacts.	image file printed	
Comments						**Total Marks (5)**	

KPIs	Excellent [3]	Proficient [2.5]	Good [2]	Acceptable [1]	Unacceptable [0.5]	No Response [0]	Secured Marks

Aims and Objectives	Aims and objectives are written to solve complex engineering problems considering cultural and societal factors with specific targets, measurement, and implementation processes that are clear and challenging and have several possible outcomes having very good impacts.	Aims and objectives are written to solve complex engineering problems considering cultural and societal factors with general targets, measurement, and implementation processes that are not clear and challenging and have some possible outcomes having good impacts.	Aims and objectives are written to solve complex engineering problems considering a few cultural and societal factors with narrow targets; measurement, and implementation processes are clear and challenging and have a few possible outcomes having some impacts.	Aims and objectives are written to solve complex engineering problems considering cultural or societal factors with a very target; measurement and implementation processes are not clear or challenging and have little possible outcome having no impact.	Aims and objectives are written to solve complex engineering problems but do not consider cultural and societal factors with any targets; measurement, and implementation processes are not clear and challenging and no possible outcomes have no impacts.	No Response at all/ copied from others /identical submissions with gross errors/ image file printed	
Comments						**Total Marks (3)**	

KPIs	Excellent [5]	Proficient [4]	Good [3]	Acceptable [2]	Unacceptable [1]	No Response [0]	Secured Marks
Literature Review	Specific formats are maintained to review and cite the literature with recent publications. Identified and analyzed the problem correctly.	Specific formats are maintained to review and cite the literature with recent publications. Identified and analyzed the problem correctly, but all issues were not addressed with relevant or intended work.	Specific formats are maintained to review and cite the literature with recent and past publications. Identified and analyzed the problem correctly, but all issues were not addressed with relevant or intended work.	Specific formats are maintained to review and cite the literature with recent and past publications. Identified but could not analyze all the problems correctly, and all issues were not addressed with relevant or intended work.	No specific formats are maintained to review and cite the literature with recent publications. Could not identify and analyze all the problems correctly, and all issues are not addressed with relevant or intended work at all.	No Response at all/ copied from others/ identical submissions with gross errors/ image file printed	
Comments						**Total Marks (5)**	

KPIs	Excellent [4]	Proficient [3]	Good [2]	Acceptable [1]	Unacceptable [0.5]	No Response [0]	Secured Marks
Experimental Block Diagram	The block diagram is drawn to show the connections of all the possible components or sub-systems to show their interdependence with all possible flows of signals from inputs to outputs.	The block diagram is drawn to show the connections of all of the possible components or sub-systems to show their interdependence with a few missing flows of signals from inputs to outputs.	The block diagram is drawn to show the connections of most of the possible components or sub-systems to show their interdependence with a few missing flows of signals from inputs to outputs.	The block diagram is drawn to show the connections of a few possible components or sub-systems to show their interdependence with some missing flow of signals from inputs to outputs.	The block diagram is not drawn to show the connections of all possible components or sub-systems to show their interdependence and flow of signals from inputs to outputs.	No Response at all/ copied from others /identical submissions with gross errors/ image file printed	
Comments						**Total Marks (4)**	

KPIs	Excellent [4]	Proficient [3]	Good [2]	Acceptable [1]	Unacceptable [0.5]	No Response [0]	Secured Marks
Possible Outcomes	Outcomes are written to achieve complex engineering problems' solutions considering cultural and societal factors and showing measurement, and implementation processes to attain the outcomes with all possible impacts.	Outcomes are written to achieve complex engineering problems' solutions considering cultural and societal factors and showing measurement, and implementation processes to attain the outcomes with some impacts.	Outcomes are written to achieve complex engineering problems' solutions considering cultural and societal factors and do not show measurement, and implementation processes to attain the outcomes without showing any impacts.	Outcomes are written to achieve complex engineering problems' solutions but do not consider cultural and societal factors and do not show measurement, and implementation processes to attain the outcomes without showing any impacts.	Outcomes are not written to achieve complex engineering problems' solutions do not consider cultural and societal factors and do not show measurement, and implementation processes to attain the outcomes without showing any impacts.	No Response at all/ copied from others /identical submissions with gross errors/ image file printed	
Comments						**Total Marks (4)**	

KPIs	Excellent [5]	Proficient [4]	Good [3]	Acceptable [2]	Unacceptable [1]	No Response [0]	Secured Marks
Gantt Chart	Specific formats are maintained to draw the Gantt chart and there is the order of workflow with all work to be done.	Specific formats are maintained to draw the Gantt chart and there is the order of workflow with a few works missing.	Specific formats are maintained to draw the Gantt chart and there is the order of workflow with some works missing.	No specific formats are maintained to draw the Gantt chart and there is little order of workflow with some works missing.	No specific formats are maintained to draw the Gantt chart and there is no order of workflow with the most important works missing.	No Response at all/ copied from others/ identical submissions with gross errors/ image file printed	
Comments						**Total Marks (5)**	

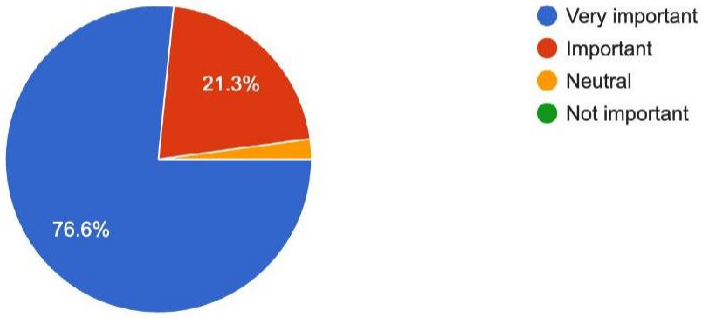
KPIs	Excellent [2]	Proficient [1.5]	Good [1]	Acceptable [0.5]	Unacceptable [0]	No Response [0]	Secured Marks
References	Specific formats are maintained to write the references, and all are recently published journal and conference papers having no missing information.	Specific formats are maintained to write the references, and all are journal and conference papers, but some old papers have missing information.	No specific formats are maintained to write the references, and many are internet sources with several missing information and very old references.	No specific formats are maintained to write the references and most of them are internet sources with missing information.	No specific formats are maintained to write the references, and all are internet sources with missing information.	No Response at all/ copied from others /identical submissions with gross errors/ image file printed	
Comments						**Total Marks (2)**	

PROJECT TITLE: Car Parking System Using Arduino

SURVEY :

1. How environmentally friendly should a parking system be?

47 responses



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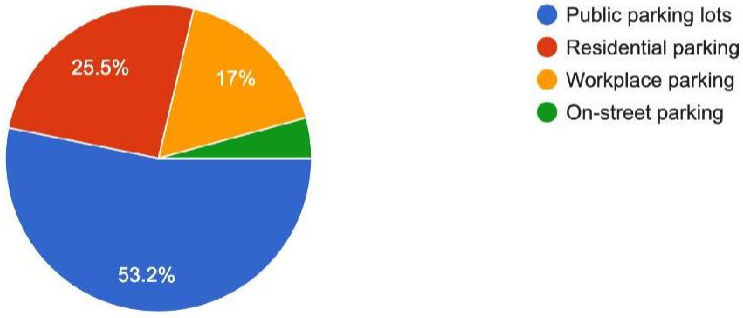
2. What type of parking spaces do you usually use?

47 responses



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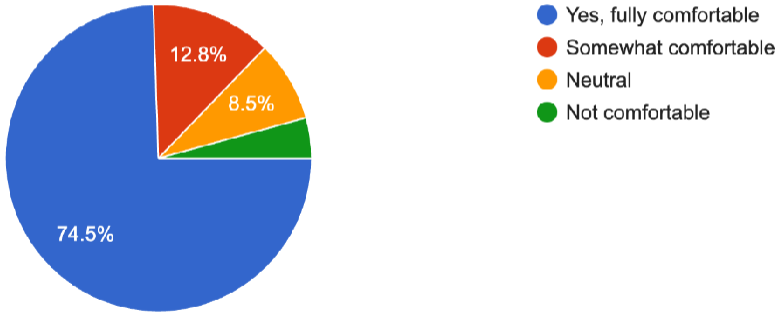
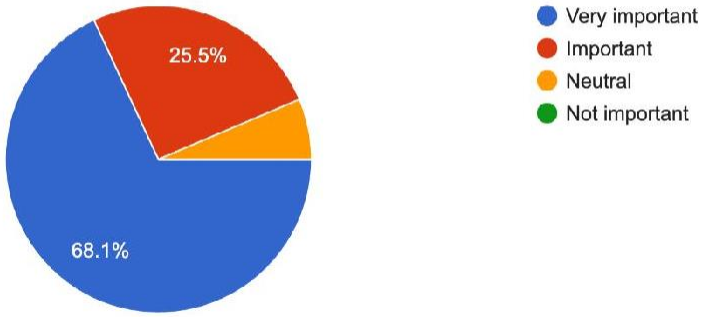
3. Are you comfortable with a system using sensors and cameras to detect parking spaces?

47 responses



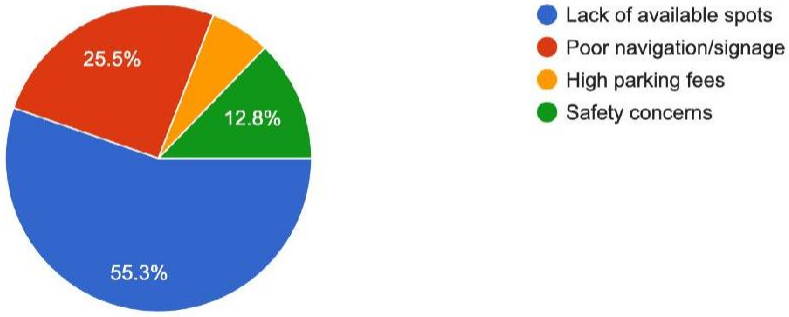
4.How important is an automated parking system to you?

47 responses



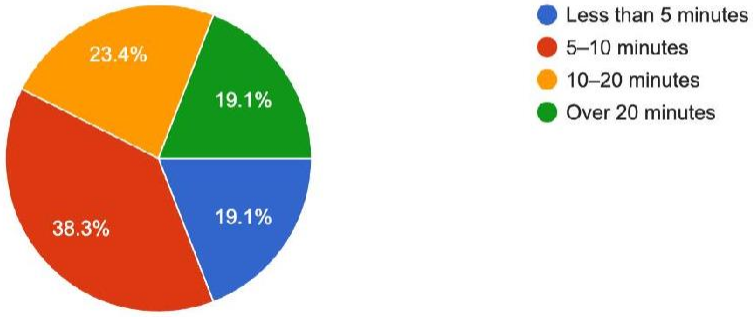
5. What is the biggest challenge you face while parking?

47 responses



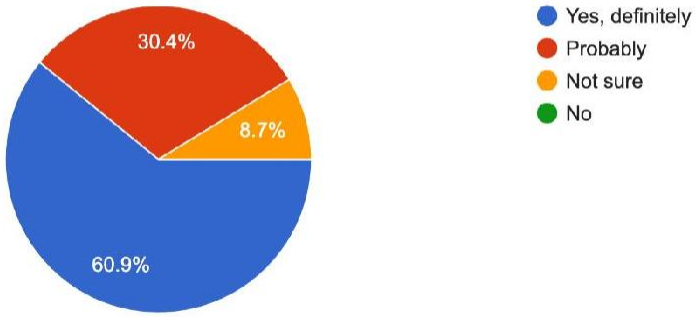
6. How much time do you typically spend searching for a parking spot?

47 responses



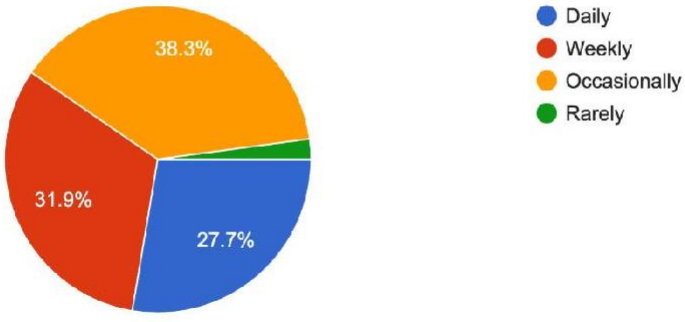
7. Do you think automated parking systems can improve parking efficiency?

46 responses



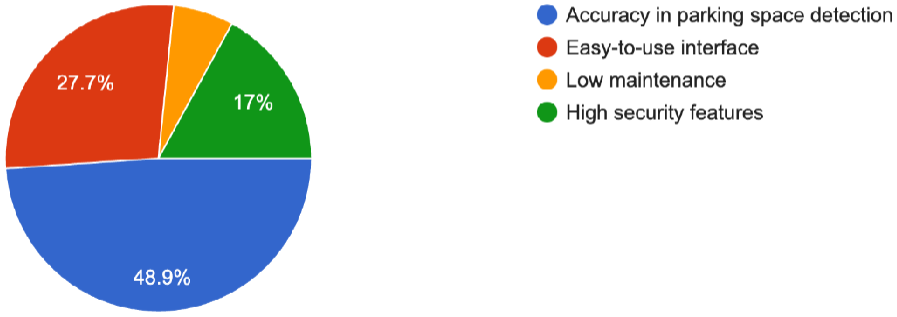
9. How often do you park in crowded areas , malls, offices ?

47 responses



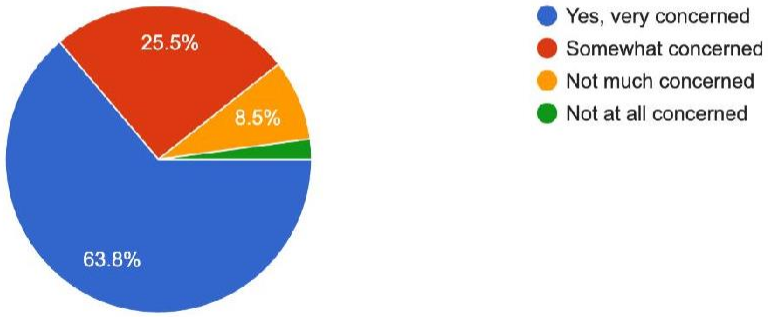
10. What factors would make you trust an automated parking system?

47 responses



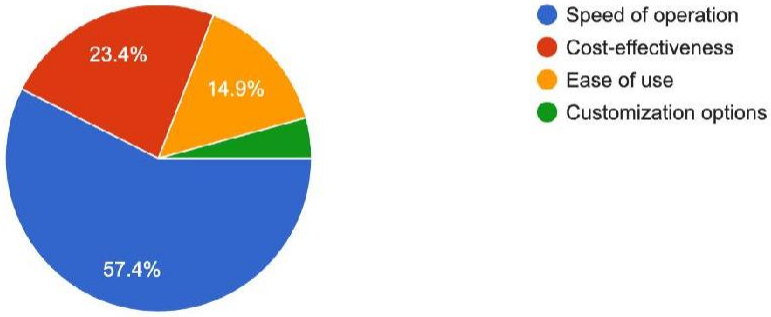
11. Are you concerned about the cost of automated parking solutions?

47 responses



12. What features should an automated parking system prioritize?

47 responses



SURVEY LINK :

https://docs.google.com/forms/d/e/1FAIpQLScEQWeO_RxErhg2Wl1recCZKxPdSRd_P8bkc7LniQfl2vQutQ/viewform?fbclid=IwZXh0bgNhZW0CMTEAAR20YNrp89v1PjZv0Q4G3DLllf3Uw6KjCj8FyPVYQCZKgzFcTg42fxXOVnY_aem_d2PMmmdJUo6gIYApdTSrjQ

AIMS AND OBJECTIVES OF THE PROJECT:

Aims of the Project

- Development of an Arduino Uno-based Smart Car Parking System with Real-Time Monitoring and Automation.
- Integration of Ultrasonic Sensors for Parking Slot Detection and Occupancy Status Monitoring.
- Enhancement of User Experience with Real-Time Display of Available Parking Slots on an LCD Screen.
- Implementation of an Efficient Parking Management System with Minimal Energy Consumption.
- Promotion of Urban Development Through the Use of Open-Source Hardware and Software Solutions.

Objectives of the Project

- **Hardware Integration**: Assembling components, including Arduino Uno, ultrasonic sensors, LCD display, and other peripherals, to create the parking system.
- **Sensor Calibration**: Ensuring the ultrasonic sensors provide accurate distance measurements for parking slot occupancy detection.
- **Software Development**: Writing Arduino code to process sensor data and display the parking slot status dynamically.
- **Testing and Validation**: Conducting thorough testing to ensure the system performs reliably under different environmental and usage conditions.

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LITERATURE REVIEW:

Smart parking systems have gained significant attention in recent years as a solution to urban parking challenges, with Arduino Uno being widely recognized as a cost-effective and adaptable platform for implementing these systems. Researchers have explored various designs utilizing Arduino Uno and sensors like ultrasonic sensors, IR sensors, and RFID to enhance parking efficiency. This literature review examines notable studies, identifies common challenges, and discusses potential solutions in the field of Arduino-based car parking systems.

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1. "Design and Development of Arduino-Based Smart Parking System"

- **Authors**: Kumar, R., & Sharma, P.
- **Published in**: *International Journal of Advanced Computing Research*, 2023

This study outlines the implementation of a smart parking system using Arduino Uno and ultrasonic sensors for real-time slot monitoring. The authors address challenges in ensuring sensor accuracy and minimizing false readings due to environmental noise. They recommend advanced calibration methods and the integration of machine learning algorithms to improve system reliability.

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2. "Optimizing Urban Parking Management Using Arduino and IoT Technologies"

- **Authors**: Lee, T., & Ahmed, S.
- **Published in**: *Journal of Smart Systems and Applications*, 2022

Lee and Ahmed explore the potential of integrating IoT with Arduino-based parking systems. Their approach combines ultrasonic sensors with an online dashboard to display real-time parking slot availability. Challenges identified include high data latency and energy consumption in continuous monitoring systems. They suggest exploring low-power communication protocols like LoRaWAN and energy-efficient hardware designs to address these issues.

"Automating Parking Space Detection with Arduino and Sensor Fusion"

- **Authors**: Zhang, Y., & Patel, R
- **Published in**: *Sensors and Automation Journal*, 2021

Zhang and Patel propose a sensor fusion approach to improve the accuracy of parking slot detection. By combining ultrasonic sensors with IR sensors, their system reduces false positives and negatives caused by environmental factors such as lighting conditions and vehicle size. The authors emphasize the need of rigorous testing in varied real-world conditions to validate system reliability..

4. "Energy-Efficient Parking Systems Using Solar-Powered Arduino Modules"

- **Authors**:Patel, N., & Kumar, R..
- **Published in**: *Renewable Energy Systems Journal*, 2021.

This study investigates the feasibility of using solar panels to power an Arduino-based parking system. The system utilizes low-power components and energy-saving modes to optimize performance. Although the system effectively reduces energy consumption, the authors note limitations in maintaining consistent power supply during cloudy days. They suggest incorporating battery storage and adaptive energy management techniques for uninterrupted functionality..

EXPERIMENTAL BLOCK DIAGRAM:

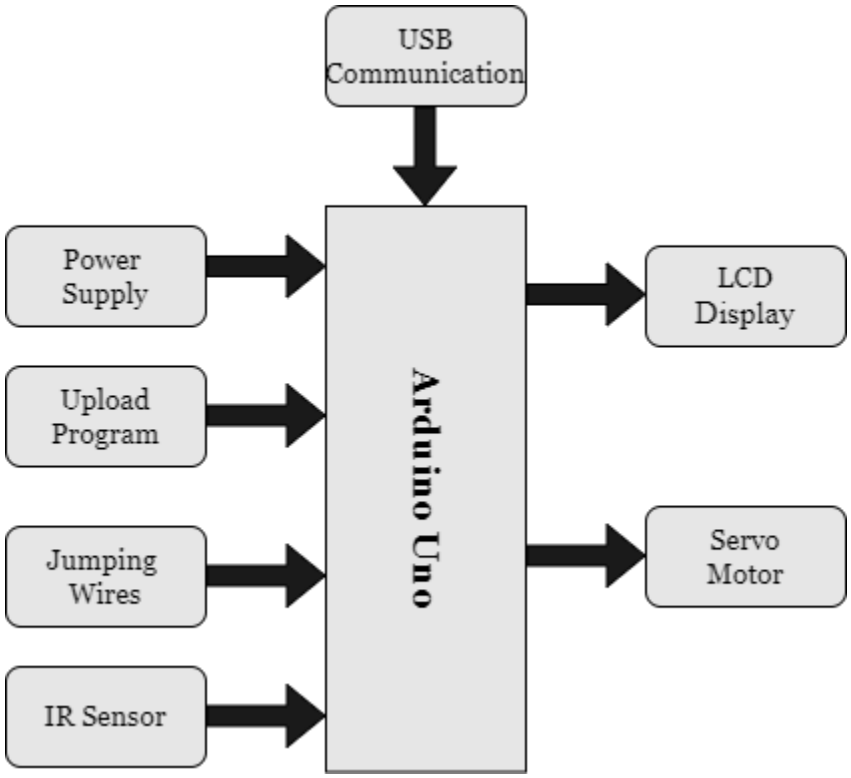

Fig : Experimental Block Diagram

POSSIBLE OUTCOMES OF THE PROJECT:

Arduino Uno-based digital weather station system can have several possible outcomes that can benefitsociety and improve its culture:

- **Improved Parking Efficiency**: The system can provide real-time information about parking slot availability, helping drivers locate free spaces quickly. This reduces time spent searching for parking and alleviates congestion in busy areas.

- **Reduced Environmental Impact**: By minimizing the time and fuel wasted during parking searches, the system contributes to lower vehicle emissions, promoting a cleaner and healthier environment.

- **Enhanced User Experience**: A digital interface displaying real-time parking data fosters a seamless experience for users, reducing stress and improving overall satisfaction with parking infrastructure.

- **Optimized Space Utilization**: By monitoring parking slot usage effectively, the system can ensure better management of available parking spaces, maximizing capacity in crowded urban areas.

- **Educational and Technological Awareness**: Developing and implementing this project can serve as a valuable learning tool for students, educators, and communities, demonstrating the practical application of Arduino technology and automation.

- **Community Engagement**: Smart parking systems can bring communities together to collaborate on modernizing public infrastructure, creating a sense of shared responsibility for urban development.

- **Scalable Urban Solutions**: The project lays a foundation for future advancements, such as integrating payment systems, IoT connectivity, or smart city applications, promoting innovation in urban planning and management.

- **Traffic Decongestion**: By efficiently directing drivers to available slots, the system can help reduce traffic jams caused by vehicles circulating in search of parking, improving overall road safety and flow.

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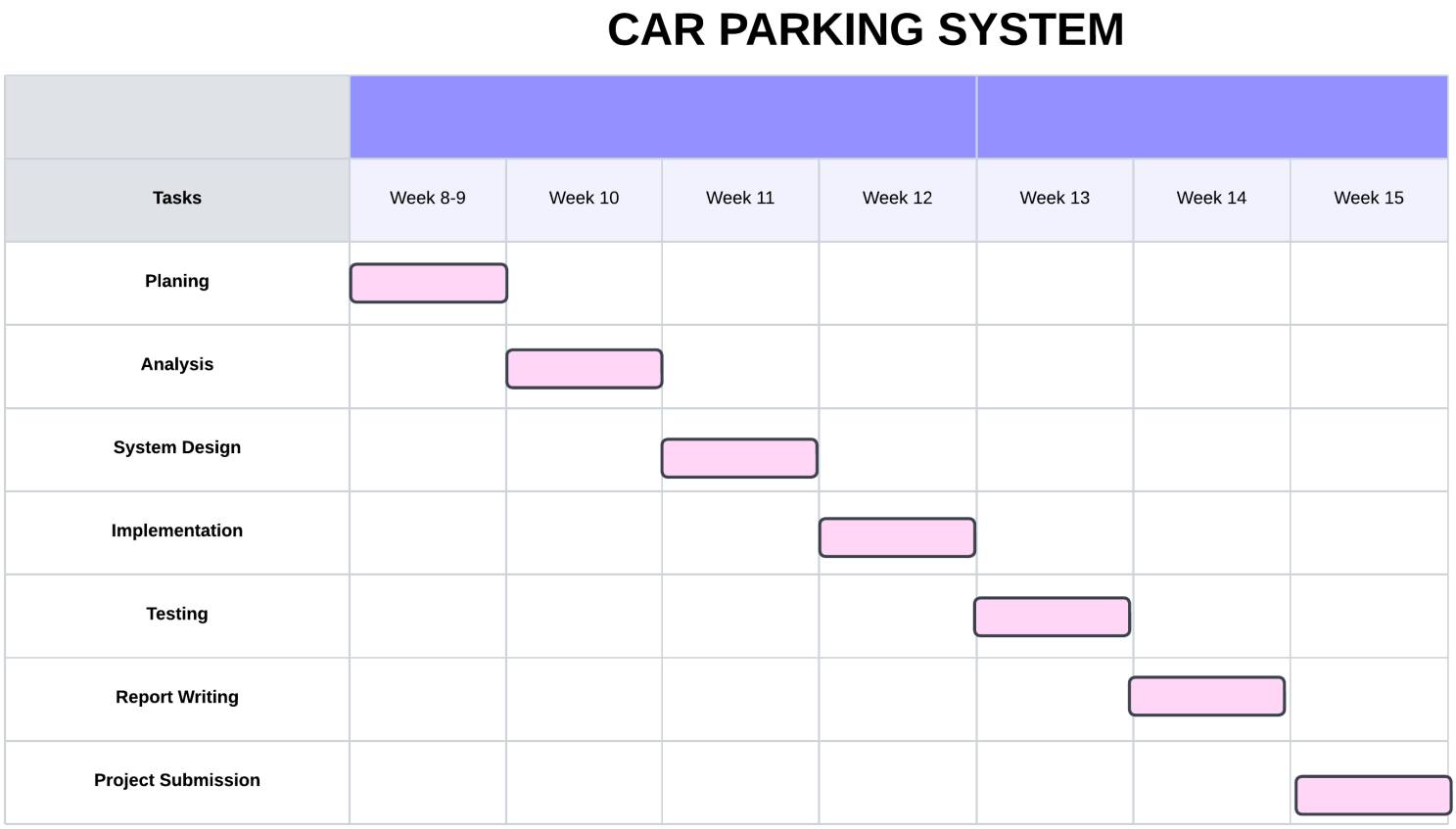
PROJECT TIMELINE (GANTT CHART):



REFERENCES:

- **"Arduino Uno Rev3"**, www.arduino.cc. Retrieved 20 February 2018.
- **"How Ultrasonic Sensors Work for Smart Parking Systems"**, www.electronics-tutorials.ws. Retrieved 12 March 2020.
- **"Infrared Sensors in Automation"**, www.techbriefs.com. Retrieved 5 June 2021.
- King, Jeremy. **"Smart Parking Systems and Their Benefits"**, Archived from the original on 22 May 2009. Retrieved 2009-04-15.
- **"RFID Technology for Automated Parking Management"**, www.rfidjournal.com. Retrieved 10 September 2022.
- **"IoT-Based Parking Solutions: A Comprehensive Guide"**, www.iotsolutionsworld.com. Retrieved 18 October 2023.

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COMMENTS BY COURSE TEACHER:

COURSE TEACHER'S NAME **COURSE TEACHER'S SIGNATURE** **DATE**