



**Department of Mechanical Engineering  
University of Moratuwa  
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**Fundamental Of Mechatronics  
ME 2041**

## **Project proposal**

### ***Water purification system***

**Submitted by:**

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## **1. Problem Overview:**

In university cafeterias, a lot of water is wasted daily. Water is wasted as a result of ineffective water use and insufficient water recycling systems. As a result, significant amounts of water are lost every day, harming the environment and stressing the resources of the university. One of the main causes of this issue is the poor system of water management in those areas.

## 2. Proposed Solution:

Building a system to purify water is the proposed solution to the problem of water waste in university areas. The system's purpose is to purify the wastewater so that it can be used for non-potable tasks like washing dishes, watering plants, and flushing bathrooms. Active carbon filters will be used in the system to remove dissolved solids and other impurities, and then a UV light treatment is going to be used to destroy germs and bacteria. Additionally, the system will have sensors that measure the water amounts in the tanks and an alert system that notifies the workforce of any problems. Our university can reduce water waste and encourage environmentally friendly water usage methods by putting this water purification system in place.

### **The water purification system will work as follows:**

1. **Separation of solid waste:** The wastewater will first pass through a solid waste separator to remove any solid waste like rice seeds or vegetable crumbles.
2. **Separation of dissolved waste:** The wastewater will then pass through two active carbon filters to remove any dissolved waste like oil or micro-level solid waste.
3. **Purification:** The purified water will be collected in a tank, and the existing germs in the water will be killed by using UV lights.
4. **Water level monitoring:** The water level in the tank will be monitored using a water level sensor. When the tank is full, the water quality will be checked.
5. **Pumping:** If the water quality is good, the water will be pumped into a higher level water tank to increase its potential energy.
6. **Water quality check:** If the water quality is not good enough, then one of the active carbon filter stops its regular filtering process and starts to filter the half purified water again so that water will be pumped back into one of the active carbon filters. And the system will also alarm the workers that the active carbon filters are not

working properly and needs to be maintained. This process only happens if the carbon filters not working properly.

7. **Monitoring:** Water level sensors will monitor the water level in the two carbon filters and solid waste separation section. If the water level exceeds its limits, the input of wastewater will be stopped to keep the purification system in order.
8. **Usage:** The final purified water will be used for flushing toilets, watering plants, and other cleaning purposes.

**Alerting System:** An alerting system will be set up to notify laborers of any errors in the system. A yellow light and beeping noise using a speaker will be set up if there is an error in water quality, and a red light and beeping noise will be set up if there is an error in the solid waste separation system.

### 3. Approaches:

**Research and Design:** This approach involves conducting research on water purification systems and their design. It will help to identify the best design and components that will be required for the system.

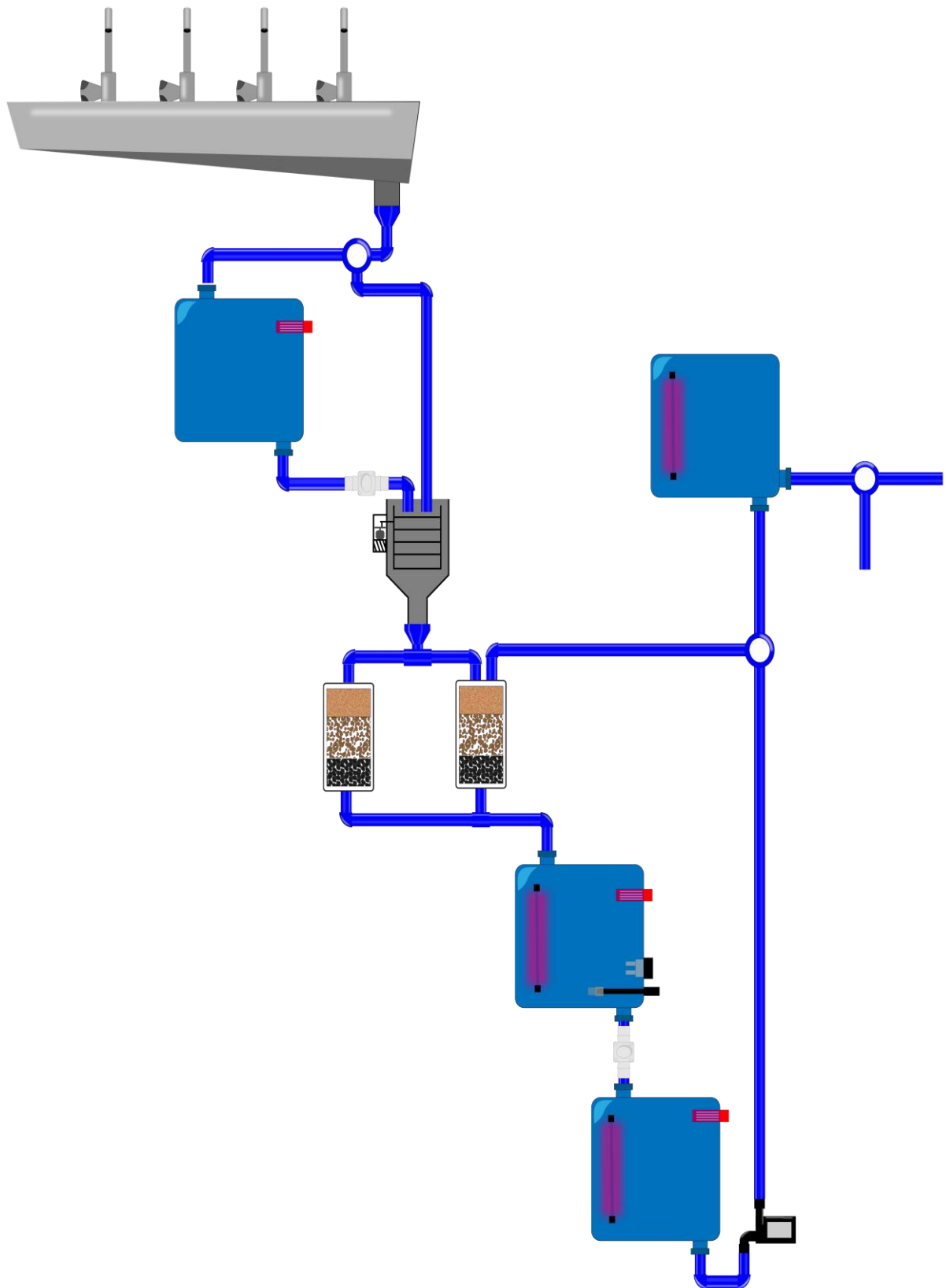
**Prototyping:** Prototyping is the process of building a preliminary version of the system. This approach will help to test the design and identify any potential issues that may arise.

**Testing:** The testing approach will be used to ensure that the system meets the required standards and specifications. It will involve various tests on the water quality, water flow, and electrical systems to ensure they are functioning correctly.

**Installation and Maintenance:** This approach will be used to install the system on-site and ensure that it is maintained and serviced regularly to ensure proper functioning.

**Safety and Environmental Standards:** The system will be designed, built, and tested to meet safety and environmental standards. This approach is important to ensure that the system is safe for users and the environment.

#### 4. Diagram:



## 5. Estimated Budget :

The budget for this project is as follows:

Component	Price(Rs.)
Five water level sensors	$100 \times 4 = 400$
Eight electrical valves	$1000 \times 8 = 8,000$
UV lights	20
Water quality sensor	3,850
Water pumping motor	1,200
motor	200
PVC pipes	3,000
Arduino Uno board	3,000
Speaker	120
LED lights	20
Jumper wires	200
Batteries	500
Miscellaneous	3,000
<b>Total</b>	<b>23,510</b>



## **6. Aims and Objectives:**

### **Aims:**

- The water purification system for university cafeteria areas should be created and developed.
- To use the purified water for non-potable uses in order to reduce water waste at the university.
- To use electronic components and Arduino code to automate the purification procedure.
- To design a water purification system that works effectively and efficiently while involving little human involvement.

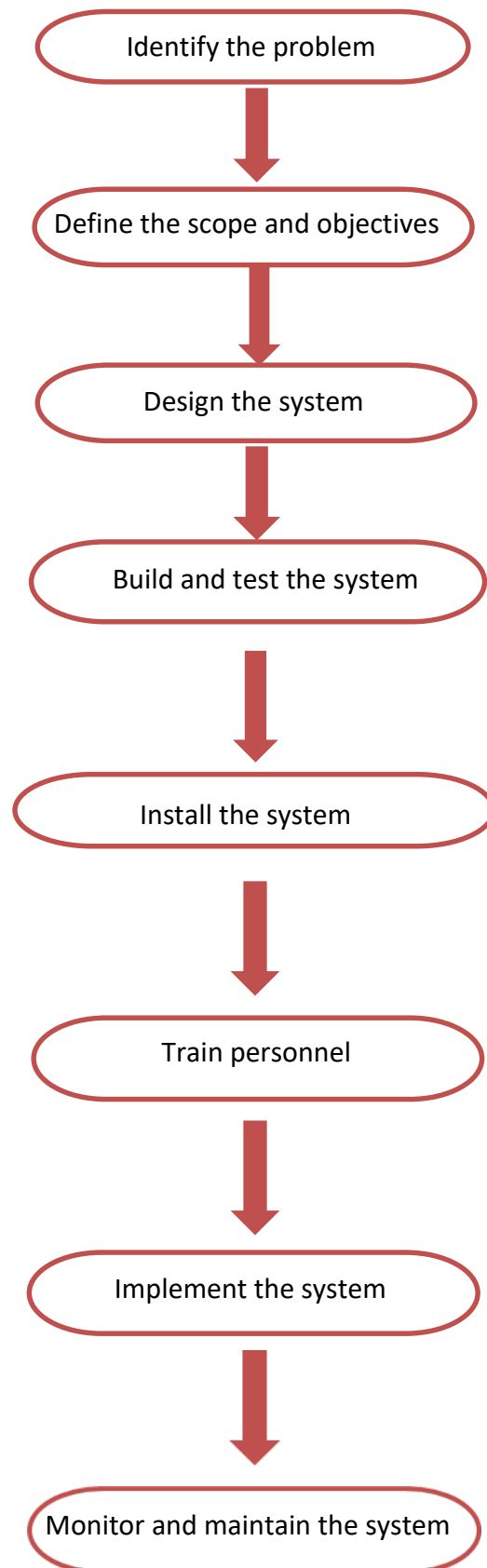
### **Our objectives are to:**

- To identify the fundamental characteristics for the water purification system, including the necessary components and design guidelines.
- The mechanical components of the water purifying system, such as the purification tank, pumps, filters, and sensors, must be designed and built.
- to program the Arduino board to automate the water filtration, pumping, and monitoring of water levels processes.
- To test and optimize the water purification system to ensure that it meets its design requirements and is effective in purifying water.
- To create a method for notifying works to purification system errors or other problems.
- To simply and effectively track the project's design process and results.
- To make proposals for the water purification system's future developments and upgrades.

## **7. Future Developments:**

- The system would need to be upgraded in order to purify water to the same standard as drinking water, which would require advanced filters and treatment methods to get rid of germs, viruses, and other contaminants that are harmful to humans.
- Operators could monitor the system's performance and status remotely, receive alerts, and perform corrections or repairs from another location, which would minimize travel time and enhance efficiency.
- Renewable energy sources can be used to power the system, making it more environmentally friendly and reducing its operating costs.

## 8. Project Process Flow:



- **Identify the problem:** The first step in the project is to identify the problem that the water purification system aims to solve. In this case, the problem is the wastage of water in university cafeteria areas.
- **Define the scope and objectives:** The project team must define the scope and objectives of the project, such as reducing water wastage, improving water quality, and promoting sustainability.
- **Design the system:** The project team must design a water purification system with components, sensors, filters, pumps, and the Arduino board, as well as develop a schematic diagram and calculate water flow rate, pressure, and other parameters.
- **Build and test the system:** Build a water purification system and test it to ensure it meets the design specifications. Testing involves running the system with wastewater and monitoring the water flow rate, pressure, and water quality.
- **Install the system:** The water purification system should be connected to the water supply and wastewater disposal systems and properly grounded and secured.
- **Train personnel:** Personnel responsible for operating and maintaining the water purification system must be trained on how to use it, including how to operate the Arduino board, monitor the system, and perform routine maintenance tasks.
- **Implement the system:** Installing a system and training personnel to monitor its performance is essential for successful implementation.
- **Monitor and maintain the system:** The water purification system must be monitored and maintained on an ongoing basis, and data should be collected to identify any areas for improvement.

## **9. Conclusion:**

A mechatronic engineering project, the water purification system suggested for the university cafeteria areas intends to address the problem of water waste by purifying and reusing the water for cleaning. The system purifies the water and keeps track of the system's success using a number of parts, including sensors, filters, pumps, and an Arduino board. The steps in the project process flow are determining problems, scope and objective definition, system design and construction, installation and implementation, and system monitoring and maintenance. The university can support sustainability, reduce water waste, and give mechatronics engineering students a worthwhile learning experience by putting this water purification system in place.