UNIVERSITY OF ENGINEERING & TECHNOLOGYMARDAN

DEPARTMENT OF ELECTRICAL ENGINEERING

FINAL YEAR DESIGN PROJECT PROPOSAL

Design of IoT Based Real-time Monitoring of Dam Gate Automation

(September-2023)

Group Members

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Abstract

Dams are mainly used for hydroelectricity and irrigation purposes that results in the construction of dams in larger areas. There are also risk factors related to existence of those dams. Therefore, it has become necessary to develop such automatic monitoring system regarding the opening of the dam gates thereby managing a system for maintaining a secure water level in dams. Mismanagement of dams can also lead manmade disasters. The dams that are present currently are monitored and controlled manually this ends up in pause in deciding. The proposed system involves automatic dam gate opening in alarming situations with real-time monitoring 24/7 on a mobile phone application anywhere internet data is available and the data can be seen on 20x4 screen. The proposed system consist of special sensors for detecting various data and sending the data to the Arduino UNO controller when the level of water in the dam reaches to a certain level the gate gets opened gradually to release the water from the dam and to retain normal conditions in the dam the system also consist of manual mood

for opening the gate. The system also consist of GSM module for sending SMS of flood warning to the public living near the area to leave which is in endangered by flood.

1. Introduction

The construction of the dames has significant role in our life as they are utilized for the purposes such as hydroelectric power generation, irrigation purposes. Now the issues the dam specialist are dealing with is that the climate conditions don't remains the same and constantly checking of dams is impossible for them manual perceptions also take additional time. Even today we have been using traditional methods for managing and monitoring the dame's gates and measuring the water level and other parameters. Furthermore, when the water level is exceeds in the dams due to heavy rains in and snow melt the water is released in the rivers, lakes and oceans depending on the dam's location it can also cause massive floods in result which can leads many serious issues to those people who are living in the that areas. These all factors contribute towards the failure of a dam because in these situations we need continuous monitoring of a dam health. To overcome all these factors we need the use of IoT (Internet of Things) for continuous monitoring of dam health we propose a model where the dam gates will be opened autonomously in alarming situations. With the help of water level sensor the water level is measured in the dam continuously. All data regarding dam are send by

the sensors to the controller and is displayed and updated all the time on a mobile phone application every time where internet is available. when the water level reaches the maximum level the water switch sensor is closed from opening condition and send a 5 volt pulse to Arduino UNO for turning on the alarm pin. The dam gate gets open autonomously to release the unwanted water. The GSM module sends the message to the people which are endangered by flood living near. The proposed system consists of two modes one is manual and the other is automatic.

2. Problem Statement

- The dam monitoring are still done with manual inspections and manual processes.
- The spill ways of dam in this modern IoT era still are operated on periodic assessments, visual operations and manual calculations.

3. Objectives of Project

- The proposed system is real-time monitored on a mobile phone application 24/7.
- The dam gates are opened autonomously when water level reaches to a certain level. The dam gates can be opened manually by using mobile phone application.
- The proposed system consists of GSM module for sending flood message to the public living near the area endangered by flood.

4. Literature Review

In [1] here sensors are used to sense the water level, soil moisture and floods then the dam gates are open when water level reaches the full reservoir level (FRL). The sensors are used to measure different levels and to check the water level and provides

alert accordingly to the authorized user. When water level reaches to the water sensor, it is sensed and an alert is given to the authorities using software application and when it reaches the second higher level another alert is sent on application. When it exceeds maximum water level, a red alert is given to the sensors to provide a signal to the microcontroller so the dam gates are open automatically. In [2] this paper intends to use microcontroller for monitoring and controlling the water distribution management by usage of various sensors, control valves, automatically & proactively manage outflow during crisis by using statistical data of the environment. In [3] the system is capable of sensing drain water and tidal water. By sensing drain water, it controls a pump to irrigate excessive water. DC motors are used to control the movement of dam gates. Arduino UNO is used as the processor. A control box is provided to control and observe the condition of the whole system.

In [4] This project is a AT89S51 microcontroller-based dam gate control system which helps in keeping an eye on the frequent usage of water resources from dam for irrigation purposes and efficient operation of dam gate according to the level of water and also helps in indicating about flood to people living in the surrounding. This proposed mechanism of dam gate control reduces the water wastage and efficient usage of available water is ensured. In [5] the remote monitoring system measures water level using ultrasonic and pressure sensors and processes data using an ATmega2560-based microcontroller using cellular communication via the Message Queuing Telemetry Transport protocol. Field testing shows accurate data when compared to established gages and proves the viability of the sensor as a low-cost, long-term remote monitoring option for dams. In [6] the proposed framework has the

ability to initiate constant alarms regarding the current status of the dam and also intimates when the dam quality has been changed from the normal conditions. To enhance the wear and tear in the structure of dams, a temperature sensor has been employed. In a nutshell, the proposed architecture aims to automate the working process of dams irrespective of their traditional diverse conditions.

In [7] the sensors installed into dam's structure and in reservoir measure physical quantities of interests such as seepage flow, water level, and deformation, pressure and temperature parameters. In this paper, the remote terminal unit (RTU) based on DSPIC30F4011 microcontroller is mainly designed to precisely measure, store and transmit instruments output to the computer server including real-time communication for dam behavior monitoring system. In [8] the main objective of this project is to develop a mechatronics-based system. This system will detect the level of water and estimate the water inflow rate in a dam and thereby control the movement of gates using IOT in a real-time basis. It offers more flexibility over existing systems. In [9] In this paper we have proposed and implemented a novel idea of automating the process of dam management from collecting the data of water level to control the dam gates. This idea will help us to streamline the control of dams throughout the country and reduce the manpower for dam maintenance.

In [10] The Internet of Things (IoT) is one of the newest and fastest-growing disciplines of technology. Using a web server as an interface, the IoT on this prototype allows for real-time management and monitoring of water level. Ultrasonic sensors for reading water level data and stepper motor actuators for sluice gate control are utilized in conjunction with an ESP 32 micro-controller. In [11] here, two ultrasonic sensors are

connected to determine the level of water; water flow sensor is used to know the speed of water; rainfall sensor is used to determine the rainfall. After measuring all the factors, the data is processed to the Node MCU, which will act as a transmitter and it will transfer the data through the wireless communication to the another Node MCU, which was situated at the office present at the dam and it will act as a receiver. After analyzing all the values, if the values exceed the limit, an alert will be sent to the authorities and then automatically the dam gates will get open. In [12] this project describes the creation of a control system for “Dam Gate Automation Control System Based on Arduino”. The objectives are to propose a control system for gate opening based on water level, design a control system of dam gate that can work fully automated by using Arduino and fabricate a prototype of the dam gate control system. With implementation of water level sensor, the opening and closing of the dam gate can be controlled by sending signal to servo motor to control the dam gate’s movement. At various levels, the water level is monitored, and the gate is controlled to close or open.

5. Methodology for Implementation of Project

5.1. Components

1. Arduino UNO
2. Adaptor
3. GSM module
4. 2 Gear motors
5. Water float (switch) sensor
6. Water level sensor

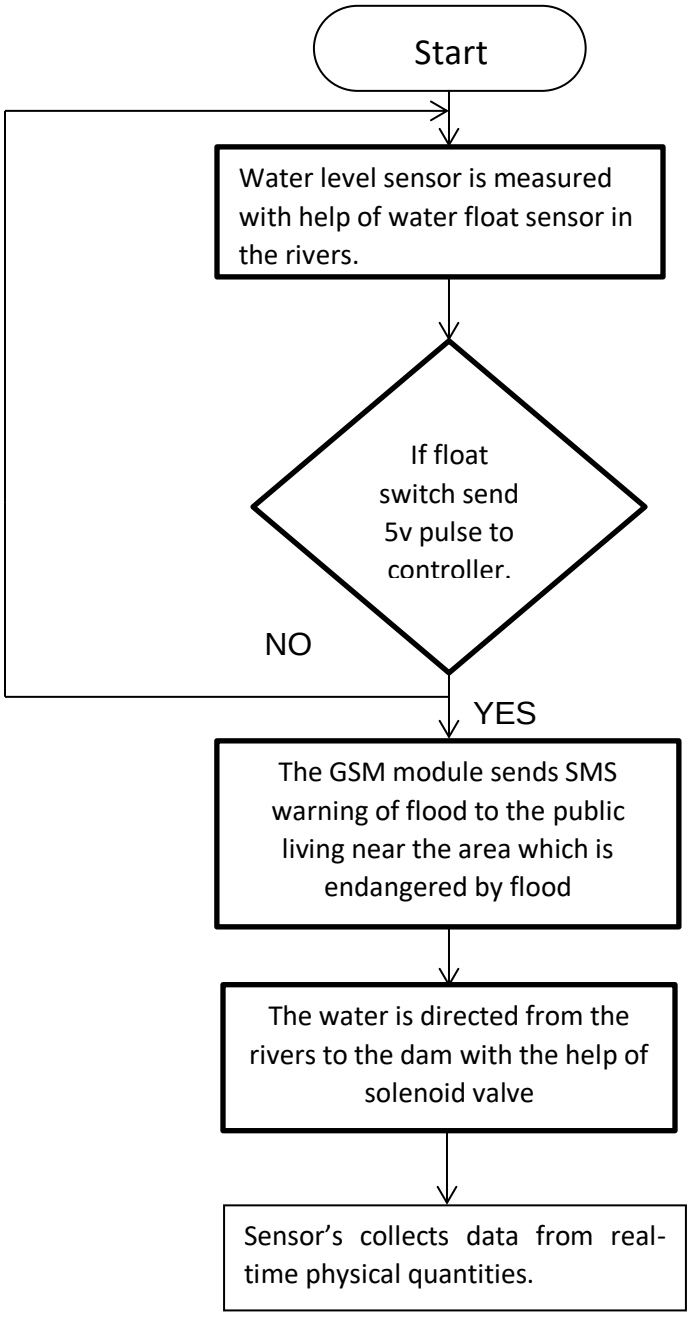
7. Limit switch
8. Water flow sensor
9. 20x4 LCD
10. Water pump module
11. Solenoid valve
12. WI-FI chip

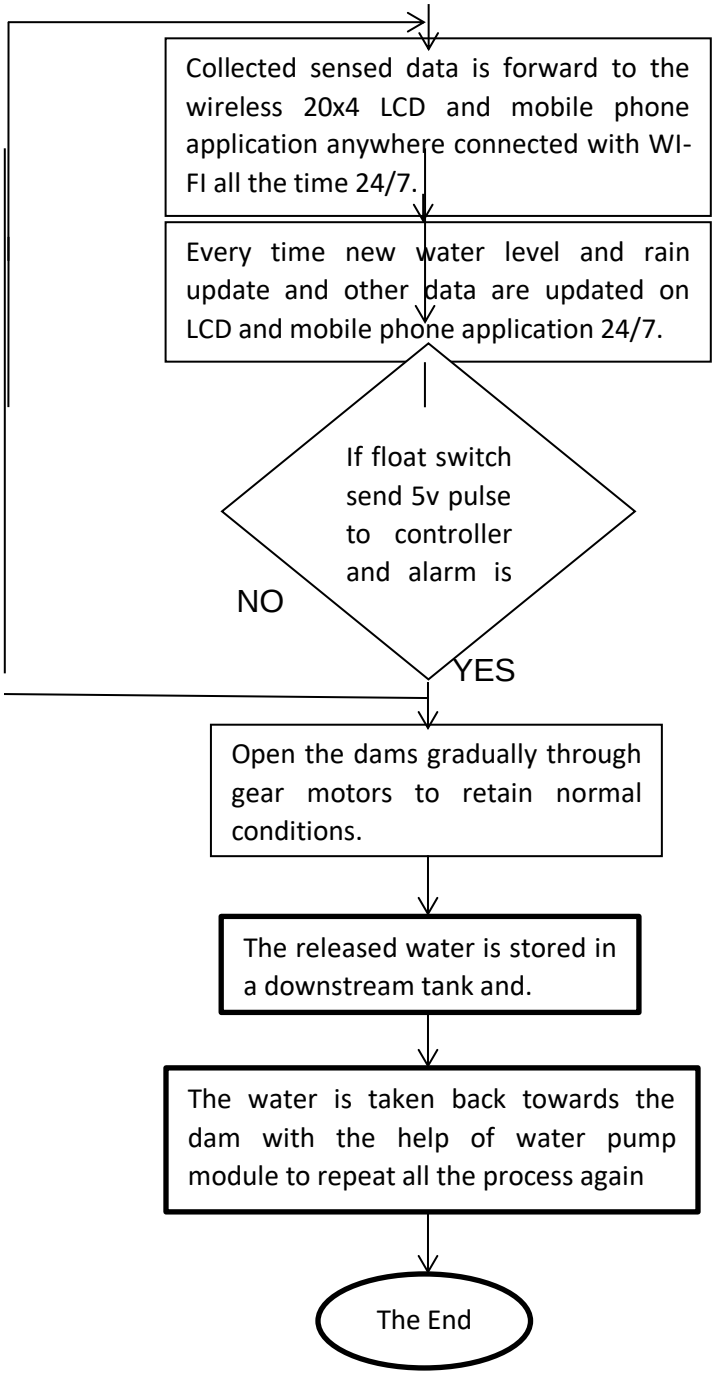
5.2. Working

In this design project consists of GSM module the design structure consists of two spaces for filling water in it and they are considered to be rivers at some distance from the dam each of the river consist of water float sensor when the water level gets high the float sensor sends pulse to the Arduino UNO controller the controller directs the signal to the GSM module the GSM module further sends SMS to the public living in the area endangered by the flood the water of the two rivers are directed towards the dam with the help of solenoid valve which we will operate manually. The dam consists of water level sensor, water float sensor, water flow sensor, rain sensor, turbidity sensor all the data from these sensors are displayed on a mobile phone application using mobile phone data or WI-FI anywhere and the data is updated with time the data regarding the dam is also shown on 20x4 LCD when the water level gets high in the dam the water float circuit is closed and it sends 5 volt pulse the Arduino UNO the and the alarm pin is on the gates of the dam are then opened gradually using gear motors and the water is released in a controlled manner to retain normal level of water in the dam. The water is stored in the downstream in a tank where the water is taken back to the dam by using water pump for repeating the process again. The dam is consists of a manual mode as

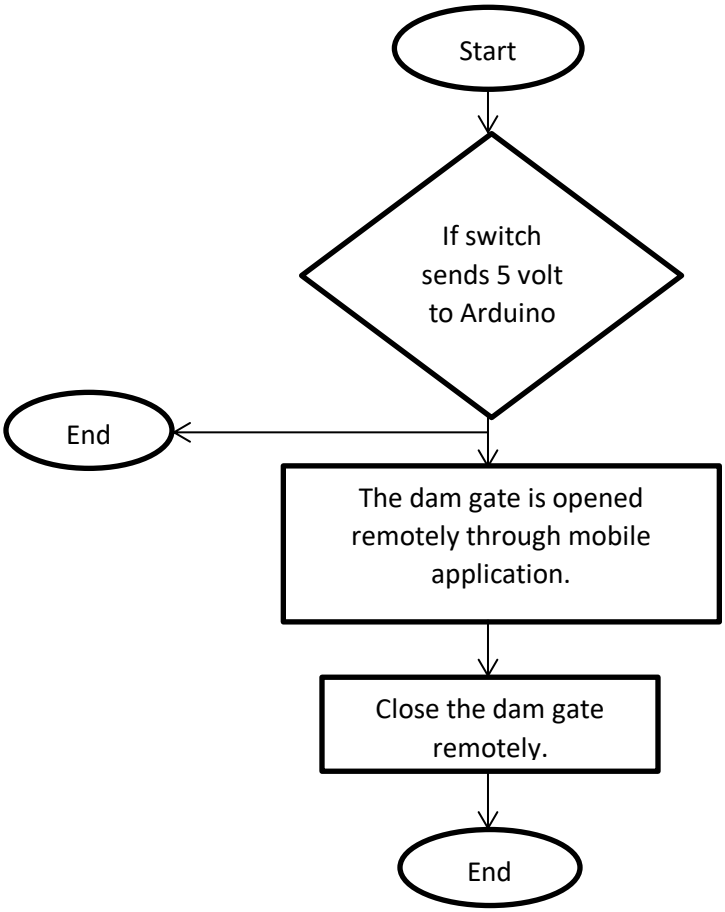
well for example the water level gets high in the dam and the water level sensor is not working properly so for that we are using limit switch sensor which will send the signal to the Arduino that the water level is high so we can open the gate by manual mode by using mobile phone application it means we can control it remotely as well.

5.3. Autonomous Dam Gate Opening Flow Chart

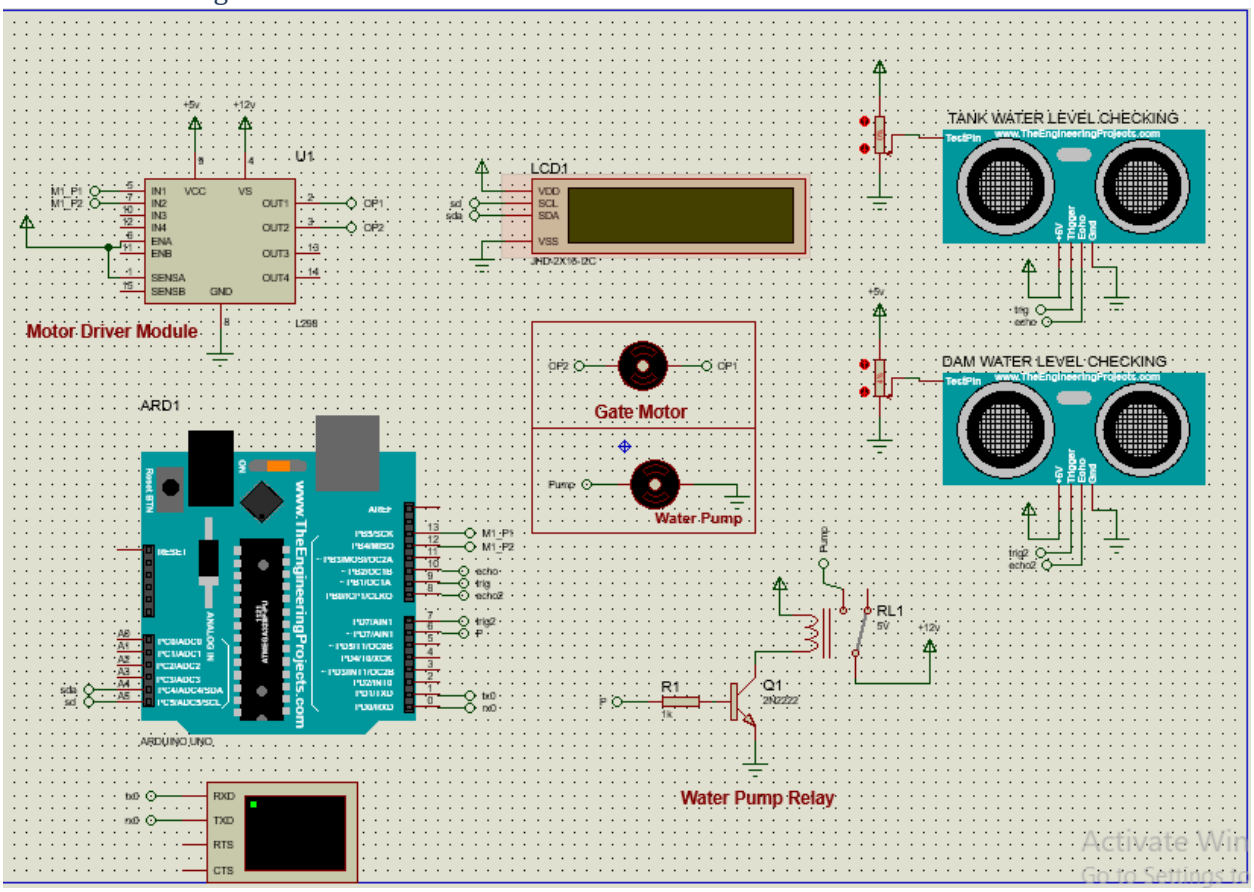



Collected sensed data is forward to the wireless 20x4 LCD and mobile phone application anywhere connected with WI-FI all the time 24/7.
Every time new water level and rain update and other data are updated on LCD and mobile phone application 24/7.
If float switch send 5v pulse to controller and alarm is
NO
YES
Open the dams gradually through gear motors to retain normal conditions.
The released water is stored in a downstream tank and.
The water is taken back towards the dam with the help of water pump module to repeat all the process again
The End

5.3.1. Manual mode Flowchart



5.4. Block diagram



Components	Price
Adaptor	700
WI-FI Chip	1500
Arduino UNO	3000
Water Float (Switch) Sensor (4)	500*3=1500
Water Level Sensor	500

Limit Switch Sensor	500
2 12V DC Motors	1500*2=3000
GSM Module	15000
Solenoid Valve	1500*2=3000
20x4 LCD	1500
Water Pump module	2000
Total Price + Miscellaneous	65000

6. *Project Implementation Schedule*

Activity	Sep-Oct 2023		Nov-2023	Dec-2023	Jan-2023	Feb-2023	Mar-Apr-2023		May 2023
Proposal draft									
Collection and study of literature									
Preparation of Schemes / Model									
Analysis of Proposed Scheme									
Implementation of Schemes/Model									
Analysis & Simulation, Hardware Testing									
Result Formulation									
Final Write-up & FYDP Report									

Submission									

7. Utilization of Project Results

Our project can help in public safety by sending SMS to public living near the areas of flood endangered. Our project will help in converting human operated work in dam to IoT technology.

9. *References*

[1] Waghmode, Ms & Shintre, Ms & Shaikh, Ms & Bhale, s & Kakad, Prof. (2022). Dam Monitoring System using IOT. International Journal for Research in Applied Science and Engineering Technology. 10. 1134-1138. 10.22214/ijraset.2022.46736.

[2] Dr. Nagesha Shivappa , Aishwarya S Rao , Aishwarya T , Jahnavi S Athreya, Mandakini H, 2020, Dam Automation using IoT, INTERNATIONAL JOURNAL OF ENGINEERING RESEARCH & TECHNOLOGY (IJERT) Volume 09, Issue 05 (May 2020), 10.17577/IJERTV9IS050617

[3] S. M. S. R. Faisal, I. U. Ahmed, H. Rashid, R. Das, M. M. Karim and S. M. T. Reza, "Design and development of an autonomous floodgate using arduino uno and motor driver controller," *2017 4th International Conference on Advances in Electrical Engineering (ICAEE)*, Dhaka, Bangladesh, 2017, pp. 276-280, doi: 10.1109/ICAEE.2017.8255366.

[4] Swaminathan, Makesh. (2013). Embedded Dam Gate Control System using ‘C’ and Visual Basic. International Journal of Computer Applications. 69. 32-37.

[5] C. Smith, J. McCain, A. R. J. Downey and J. Imran, "An Open-Source IoT Remote Monitoring System for High-Hazard Dams," *2022 IEEE Sensors*, Dallas, TX, USA, 2022, pp. 1-4, doi: 10.1109/SENSORS52175.2022.9967232.

[6] V. Sathya, K. Arun, H. Mahajan and A. K. Singh, "Automate the Functioning of Dams Using IoT," *2019 3rd International Conference on Computing Methodologies and Communication (ICCMC)*, Erode, India, 2019, pp. 1102-1105, doi: 10.1109/ICCMC.2019.8819778.

[7] P. Komeswarakul, P. Saengsatcha, A. Jomtarax, K. Suksomboon and U. Lewlomphaisarl, "Remote terminal unit for automatic dam monitoring system using a microcontroller," *SICE Annual Conference 2011*, Tokyo, Japan, 2011, pp. 2794-2797.

[8] Santosh MM, Sajuram NA, Santosh PB, Bhikaji SS, Kulkarni MP. Water level monitoring and dam gate control over IoT. International Journal on Future Revolution in Computer Science & Communication Engineering. 2018;4(4):141-5.

[9] S. S. Siddula, P. C. Jain and M. D. Upadhayay, "Real Time Monitoring and Controlling of Water Level in Dams using IoT," *2018 IEEE 8th International Advance Computing Conference (IACC)*, Greater Noida, India, 2018, pp. 14-19, doi: 10.1109/IADCC.2018.8692099.

[10] G. Sasikala, S. Srinivasan, J. Navarajan and M. M. Theresa, "IoT based Water Level Monitoring and Management in Reservoir," *2022 3rd International Conference on Electronics and Sustainable Communication Systems (ICESC)*, Coimbatore, India, 2022, pp. 1763-1767, doi: 10.1109/ICESC54411.2022.9885714.

[11] J. Sampson, R. Nandakishore Reddy, M. Venkata Janardhan Reddy, M. Chandra Narayana and R. Varun Kumar, "IoT based Early Flood Detection, Destruction Avoidance and Automated Dam Gate Control System," *2023 Third International Conference on Artificial Intelligence and Smart Energy (ICAIS)*, Coimbatore, India, 2023, pp. 147-151, doi: 10.1109/ICAIS56108.2023.10073890.

[12] Hamidun MA, Ibrahim SA. Dam Gate Automation Control System by Using Arduino. Progress in Engineering Application and Technology. 2022 Jun 19;3(1):683-90.

FYDP to CEP Mapping

S #	Attribute	Complex Problem	Targeted (Yes/ No)	Justification
1.	Preamble	*Engineering problems which cannot be resolved without in-depth engineering knowledge. And have some or all of the characteristics listed below:	Yes	The dam gates automation and sending SMS via GSM module.
2.	Range of conflicting requirements	Involve wide-ranging or conflicting technical, engineering and other issues.	Yes	Acknowledging a range of conflicting requirements is crucial in representing the real world complexity of the problem.
3.	Depth of Analysis required	Have no obvious solution and require abstract thinking, originality in analysis to formulate suitable models.	Yes	Depth analysis is essential to ensure a comprehensive understanding of the complexities involved in dam gate automation

				using IoT and flood warning.
4.	Depth of Knowledge required	Requires research-based knowledge much of which is at, or informed by, the forefront of the professional discipline and which allows a fundamentals-based, first principles analytical approach.	Yes	Deep knowledge of IoT systems, flood management, and communication protocols is necessary for successful implementation of this project.
5.	Familiarity of issues	Involve infrequently encountered issues	Yes	Understanding both common and infrequent issues related to dam gate automation and IoT ensures a more comprehensive.
6.	Extent of application codes	Are outside problems encompassed by standards and codes of practice for professional engineering.	Yes	To develop a vast range of application codes is necessary to achieve different scenarios. Automation of dam sending all the data of physical quantities to application.
7.	Extent of stake-holder involved	Involve diverse groups of stakeholders with widely varying needs.	Yes	By involving stakeholders, your wants are considered, boosting project acceptance and success.
8.	Consequences	Have significant consequences in a range of contexts.	Yes	For informed decision- making and risk mitigation, it is vital to understand potential consequences, such as

				environmental impacts or system failure.
9.	interdependence	Are high level problems including many component parts or sub problems.	Yes	Multiple interdependent components, such as sensors gate monitoring, and communication systems, must work together to ensure project success.

* Prime Attribute

FYDP to SDGs Mapping

Sustainable Development Goals (SDGs)		
Goal#	**Description**	**Justification**
Goal 1	**NO POVERTY** End poverty in all its forms everywhere	
Goal 2	**ZERO HUNGER** End hunger, achieve food security and improved nutrition and promote sustainable agriculture	
Goal 3	**GOOD HEALTH & WELL-BEING** Ensure healthy lives and promote well-being for all at all ages	
Goal 4	**QUALITY EDUCATION** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	
Goal 5	**GENDER EQUALITY** Achieve gender equality and empower all women and girls	
Goal 6	**CLEAN WATER AND SANITATION** Ensure availability and sustainable management of water and sanitation for all	Yes (By using turbidity sensor it will make the dam water clean from dirt and contributing to clean water.)
Goal 7	**AFFORDABLE AND CLEAN ENERGY** Ensure access to affordable, reliable, sustainable, and modern energy for all	

Goal 8	**DECENT WORK AND ECONOMIC GROWTH** Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all	
Goal 9	**INDUSTRY, INNOVATION, AND INFRASTRUCTURE** Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.	
Goal 10	**REDUCED INEQUALITIES** Reduce inequality within and among countries	
Goal 11	**SUSTAINABLE CITIES AND COMMUNITIES** Make cities and human settlements inclusive, safe, resilient and sustainable	Yes (Dam gate automation improves community stability and promotes sustainable urban development by minimizing flood risks.
Goal 12	**RESPONSIBLE CONSUMPTION AND PRODUCTION** Ensure sustainable consumption and production patterns	
Goal 13	**CLIMATE ACTION** Take urgent action to combat climate change and its impacts	Yes (Dam gate automation enabled by IoT can reduce water wastage use and flood risk while ensuring that project is carried out in accordance with climate action objectives.)
Goal 14	**LIFE BELOW WATER** Conserve and sustainably use the oceans, sea and marine resources for sustainable development	
Goal 15	**LIFE ON LAND** Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	
Goal 16	**PEACE, JUSTICE AND STRONG INSTITUTIONS** Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	
Goal 17	**PARTNERSHIPS** Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development	

Undertaking

This is to certify that to the best of my knowledge; the content of this project proposal is my own work. This proposal has not been submitted for any degree or other purposes. I certify that the intellectual content of this project is the product of my own work and that all the assistance received in preparing this proposal and sources have been acknowledged.

Signature of Students

Name of Students

Usman Farooq

Uzair Khan

Ismail Khan

Registration Numbers

20MDELE165

20MDELE166

20MDELE120

Proposed Supervisor's Comments

Signature of Supervisor

Name of Supervisor

Dr Ajmal Farooq

Designation of Supervisor

Comments of FYDP Coordinator

Signature of FYDP Coordinator: _____ Dated: _____

Approval by the Chairman of Department

Signature: _____ Dated: _____

Other Important Instructions

Proposal Format:

Font: Arial 14 for headings and Arial 12 for rest of text (except title page)
Line spacing: Double
Margins: 1 inch on all sides
Justify Paragraphs: Align text to both right and left margins
Paper Size: A4
Binding information: Single Side Printing and use spiral binding for hard copies.

Other Important Information:

1. Proposals which are submitted after **1st Week of 7th Semester** will be rejected.
2. The students will discuss their proposals with concerned proposed supervisors. Only hard copies duly signed by the concerned Supervisor / Teacher will be accepted.
3. Any group having more than THREE members will be rejected.

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