

# RFID Based Security for Exam Paper Leakage using Electromagnetic Lock System

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**Abstract:**The examination is mainly the heart of the education system. The main purpose of the examination is to select the capable candidates for different positions. Each and every year we hear news about postponed/cancelled exam due to paper leakages. So we have come up with a compact and portable solution and decided to design and implement an examination paper leakage protection system which is a highly secured system based on ARM processor. Along with GSM modem, RFID module, keypad, and electromagnetic lock are used in this system. First the question paper comes to the college from university in an electronic sealed box which is called Electronic Control Box. The Electronic Control Box is an embedded system that was designed using ARM processor, which has inbuilt RTC to monitor the Electronic Control Box. If anyone tries to open that box before and after the RFID swipe time duration, the system communicates to the university authorities by sending an SMS (Short Message Service) through GSM that "some malfunctioning has taken place with the Electronic Control Box". In case if the password doesn't match, the user who has access will get the message in his phone. The buzzer will be ON once if the invalid password is entered. So we can easily identify that the exam papers have been leaked.

**Keywords:**Examination papers, ARM processor (LPC2148), RFID, GSM, Keypad, Electromagnetic lock.

## Introduction

Education is basically the motivating force of the society. An examination is the assessment planned to measure the skill, knowledge, physical fitness or aptitude and also classification in so many subjects. An exam may be on paper, on the computer, orally, in exam centers, which are conducted to test, calculate or examine the set of skills. Also the main purpose of the examination is to select the capable candidates for different positions [1] [2].

For the students main issues are question paper leakage, who suffer from the postponed or cancellation of the examination. Each and every year we hear news about postponed/cancelled exam due to paper leakages in the newspaper or on television. Sometimes the university itself doesn't know how there is leakage of any information content related to question papers. Hence, some student gets good rank in minimum time and with less effort and those students who really deserve the rank will not score even after hard work and maximum efforts. This aspect will create negative effect on students and demoralize the growth of society. So we have come up with a compact and portable solution and decided to design and implement an examination paper leakage protection system based on ARM processor [6]. Along with the ARM processor (LPC2148), GSM modem, RFID module, keypad, LCD and electromagnetic lock are used in this system [3].

First the question paper comes to the college from university in an electronic sealed box which is called Electronic Control Box. The Electronic Control Box is an embedded system that was designed using ARM processor, which has inbuilt RTC to monitor the Electronic Control Box. If anyone tries to open that box before and after the RFID [1] [4] swipe time duration, the system communicates to the university authorities by sending an SMS (Short Message Service) through GSM (Global System for Mobile communication) that "some malfunctioning has taken place with the Electronic Control Box".

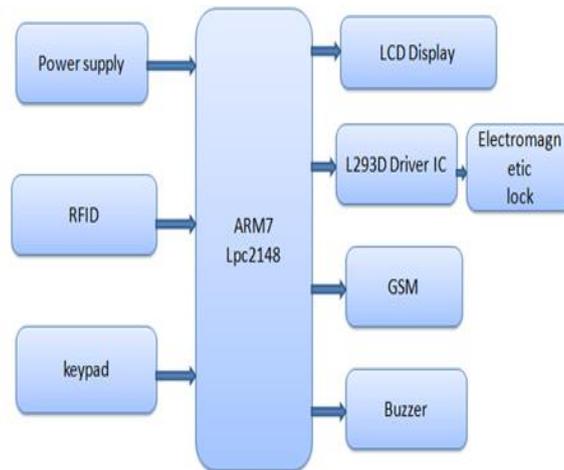


Figure.1. System Block Diagram

The university authorities send a unique password to the chief authority of the college before 10 minutes of the exam. The chief authority has been given a valid RFID card along with a dummy RFID card from the university. The authorized person swipes the card [5]. The system acknowledges for the password if the card is valid. Chief examiner needs to type the password which is provided by the university using the keyboard. If password is correct, the electromagnetic lock rotates and unlocks the Electronic Control Box. This system has two transceivers. The transceiver 1 is an embedded system related to the Electronic Control Box. The transceiver 2 is the mobile phone with the university authorities. The present module work deals with the hardware and software part

### Problem Definition

In this system we are using first level security which is an RFID [6] [9] card with a particular or unique number which is provided by university to every college. GSM is used for any unauthorized user tampering. If any unauthorized users try to open the box, then immediately a message will go to the university authorities through the GSM. The Keypad is the second level security in this system for date, time and password matching.

### Related Research

Today the system which is in wide use involves the practice followed from many years. This involves the sealed boxes containing the question papers which will be distributed to the examination centers. This system involves many disadvantages which may lead to leakage of question papers at various instances while the box is moved from printing location to examination centers. This happens due to easy tampering of sealed boxes and more human interference.

The other method which is in use today involves the mailing of the question papers from the university to respective colleges prior to examination. The colleges take the printouts of the question paper and then the examination procedure follows. Even this particular method also involves many disadvantages. The sever breakdown may occur, website may be hacked, and more than 100 colleges should take printouts which involves the threats like power failure, system failure and leakage of the paper.

The idea for the proposed system which involves the electronic protection is derived from modern day equipments like automated teller machine (ATM), Electronic lockers and other security enhanced electronic systems. This system involves the integration of certain electronic peripherals that works on the technologies based on RFID, GSM, I2C, and UART [7] [8].

## System Implementation

### RFID Reader module

**Radio-frequency identification (RFID)** uses electromagnetic fields to automatically identify and track tags attached to objects. The tags contain electronically stored information. Passive tags collect energy from a nearby RFID reader's interrogating radio waves. Active tags have a local power source (such as a battery) and may operate hundreds of meters from the RFID reader. Unlike a barcode, the tag need not be within the line of sight of the reader, so it may be embedded in the tracked object. RFID [9] is one method for Automatic Identification and Data Capture (AIDC).



Figure.2. RFID Reader

**GSM module**

**GSM** is a standard developed by the European Telecommunications Standards Institute (ETSI) to describe the protocols for second-generation digital cellular networks. 2G networks developed as a replacement for first generation analog cellular networks, and the GSM standard originally described as a digital, circuit-switched network optimized for full duplex voice telephony. This expanded over time to include data communications, first by circuit-switched transport, then by packet data transport via GPRS (General Packet Radio Services) and EDGE (Enhanced Data rates for GSM Evolution, or EGPRS). Subsequently, the 3GPP developed third-generation (3G) UMTS standards, followed by fourth-generation (4G) LTE Advanced standards, which do not form part of the ETSI GSM standard. GSM is a trademark owned by the GSM Association. It may also refer to the (initially) most common voice codec used, Full Rate.



Figure.2.1. GSM Module

**Electromagnetic lock**

An **electromagnetic lock** is a locking device that consists of an electromagnet and an armature plate. There are two main types of electric locking devices. Locking devices can be either "fail safe" or "fail secure". A fail-secure locking device remains locked when power is lost. Fail-safe locking devices are unlocked when de-energized. Typical single door electromagnetic locks are offered in both 600 lbs.(272 kg) and 1200 lbs. (544 kg) dynamic holding force capacities. The strength of today's magnetic locks compares well with that of conventional door locks and they cost less than conventional light bulbs to operate.



Figure.2.2. Electromagnetic Lock

**Working Operation**

- a. The kit is first switched ON by giving the power supply.
- b. The LCD gives a welcome message. The kit should be reset for proper functioning.
- c. A card is to be shown at the RFID reader which reads the information encoded in the card.
- d. The prompt asks to enter a mobile number to which the OTP has to be sent.
- e. The prompt asks to show the card. If the card is valid, then it sends an OTP the given mobile number. Otherwise a message is sent to the number that an unauthorized action has been taken place.
- f. The OTP needs to be entered by using the keypad.
- g. If the OTP entered is correct, the lock gets opened. Otherwise, a message is sent to the authorities about the unauthorized access.

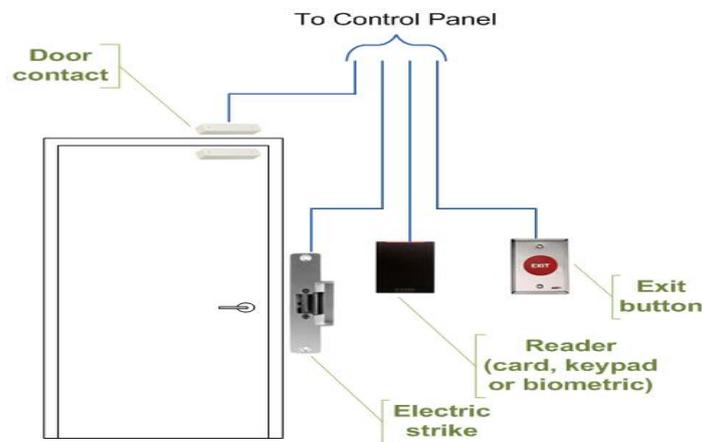


Figure.3. Working Condition of Electronic magnetic lock

**Flow Chart**

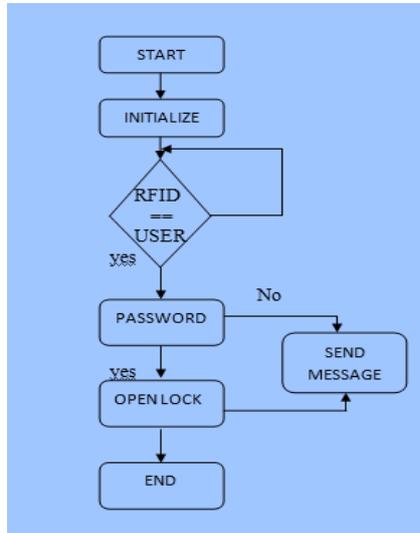


Figure.3 Systems Design Flow Chart

**Hard Ware Result**



Figure.4. System Hard ware description

The diagram for the Exam paper leakage protection system is shown in fig.1. Vibration sensor is connected to the port pin of Microcontroller. GSM Module is connected to the port pin of transmitter pin of microcontroller and receiver pin is connected to RFID reader module. Matrix key board connected to complete eight bit port. When did it gets vibrations before time then it will be connected to ground i. e. active low. And into controller programming we read the data from inbuilt. Mobile number and sent it to SMS sending i.e. at command format.

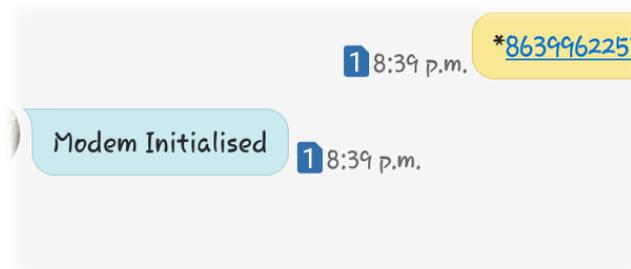


Figure.4.1 Device Initialize with GSM Module

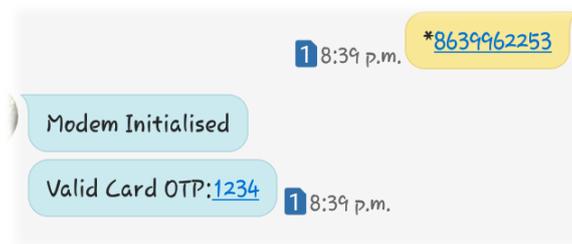


Figure.4.2. Authorized person access then OTP Sent to Mobile

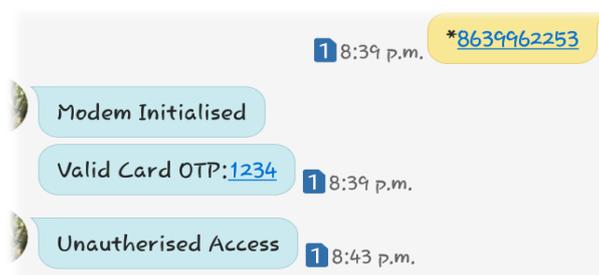


Figure4.3. If entered wrong password it gives unauthorised Access

## Applications

- i. This project can be extended to protect the answer sheets to send it to the university authorities.
- ii. It can also be used in various other applications where protection of documents or any valuables is needed.
- iii. Used in banks for security purposes.

## Conclusion

The Design and its implementation of ARM processor based electronics protection for the exam paper leakage system were effectively carried out with the advantages of minimum peripheral interfaces, low power consumption, low cost, high portability. The response of the system is successfully tested in all the conditions of the system that is mentioned in the system functionality.

The compact and cost effective solution for the examination paper leakage system was achieved with ARM processor controller. This project can be extended to protect the answer sheets to send it to the university authorities. It can also be used in various other applications where protection of documents or any valuables is needed. The embedded system can be programmed to close the Electronic Control Box after the completion of the exam

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