Class Kit Vending Machine  
Conceptual Design

Nidhay Patel   
Department of Electrical and Computer Engineering  
*Tennessee Technological University*   
*Cookeville, United States of America*  
*npatel45@tntech.edu*

Austin Sigg  
Department of Electrical and Computer Engineering  
*Tennessee Technological University*   
*Cookeville, United States of America*  
*aesigg42@tntech.edu*Dillon Williams  
Department of Electrical and Computer Engineering  
*Tennessee Technological University*   
*Cookeville, United States of America*  
*dswilliams42@tntech.edu*

Ryan Reed  
Department of Electrical and Computer Engineering  
*Tennessee Technological University  
Cookeville, United States of America*  
*rcreed42@tntech.edu*Michel Turpeau  
Department of Electrical and Computer Engineering  
*Tennessee Technological University  
Cookeville, United States of America*  
*mmturpeau42@tntech.edu*

# Introduction

Around fifty devices a day are needed by students each year for their ECE (Electrical and Computer Engineering) courses. The main emphasis of this capstone project is the design and implementation of a vending machine that can loan out devices to students while keeping track of which students have taken the devices. A student can enter their information into the machine, and it will keep track of who has borrowed each device(s). Students will be able to view and choose which gadget to remove with the help of an LED (Light Emitting Diode) equipped drawer system. Designing the entire system gives the machine the ability to meet all requirements of the customer. The machine shall comply with the following specifications of the customer.

The machine will be no taller than the average window height, which is around 2 to 3 feet, and no smaller than 2 feet in height. This allows for easy portability from the office to the student lounge at Brown Hall and vice versa. It should impact the customers and allow the office associates to be able to transport the machine where it is needed. Due to our ethical considerations, the machine will use ethernet to send data to our customers to avoid others from accessing the students’ information. We have also considered including either a hash or encryption on the data sent.

To allow proper function of the machine, an MCU (microcomputer unit) to manage the data acquisition system is needed. A SQL (structured query language) database will be programmed into the MCU to hold the student ID (identification) number, name, email, course, and which board has been rented, as required by the customer. The boxes the devices are held inside must be uniquely identifiable according to the department, so each box must be scanned into the database before a device is taken. This is to prevent the theft of a device by any student and allows the customer to know which is taken. For the same reason, the machine shall have a card reader to ID every student. This way no student can fake the number, even if other information was incorrect.

For the entire machine to function after a reset and to remember information for the customer, the machine is required to have a form of nonvolatile memory such as MicroSD or an actual separate drive. The machine must have a series of LED (light emitting diode) indicators so the student knows which drawer and compartment to access when retrieving the board. Solenoid Locks shall be installed into the drawers and compartments so no single person can easily break through to the devices when the machine is unsupervised. The current plan is for a drawer and compartment to hold for several minutes to allow enough time for a worker to notice the attempt.

The following subsections provide detail on each of the previous requirements and how each shall be completed according to the customer.

# Background

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# Background

## Micro Controller

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1. SQL Database:
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1. Control Locks

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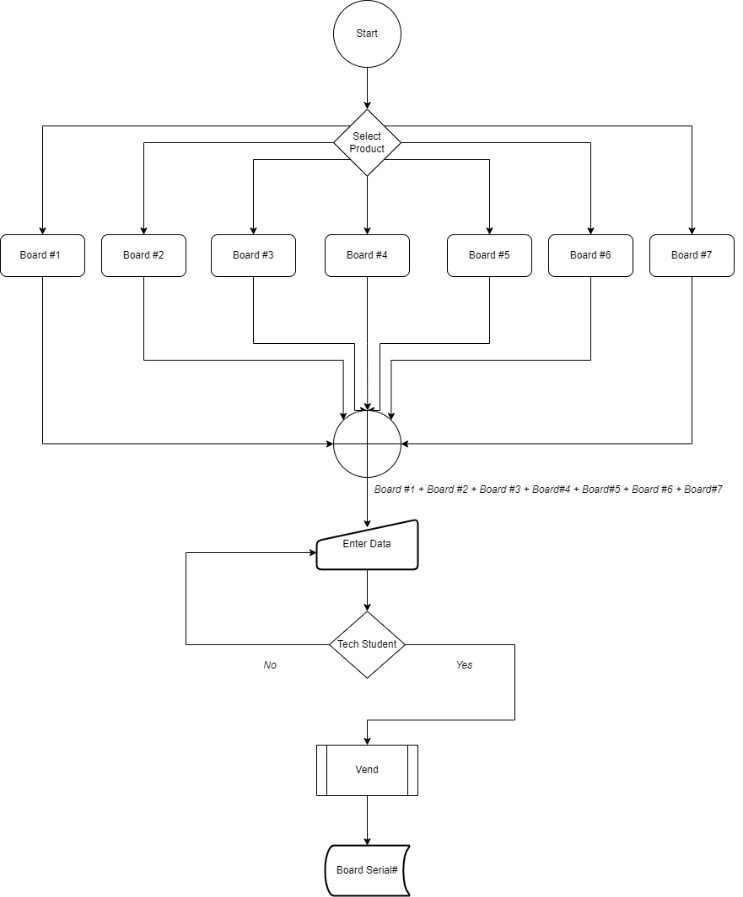
# Design And Implementation

The following design for a class kit vending machine is suggested in order to address the drawbacks of the current approach and to offer a solution that is both affordable and user-friendly. The project's primary components—the power supply, the card reader, the motor driver, and the LCD—are shown in Fig. 1 as being composed of five elements.



*Figure 1: Overall Design of Machine*

In order to understand the overall design the process must be acknowledged first. The process would be very simple. A student would walk into the office of Electrical and Computer Engineering and using the Eagle Card he/she would tap on the reader and after verifying the information the student then will choose the required board from the given set of choices on LCD and after doing so one of the drawers would pop open and with the help of LEDs the student would grab the needed board and close the drawer as shown in figure 2.



*Figure 2: Design Flow of Machine*

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## Units

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*a**b* 

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## Some Common Mistakes

* The word “data” is plural, not singular.
* The subscript for the permeability of vacuum **0, and other common scientific constants, is zero with subscript formatting, not a lowercase letter “o”.
* In American English, commas, semicolons, periods, question and exclamation marks are located within quotation marks only when a complete thought or name is cited, such as a title or full quotation. When quotation marks are used, instead of a bold or italic typeface, to highlight a word or phrase, punctuation should appear outside of the quotation marks. A parenthetical phrase or statement at the end of a sentence is punctuated outside of the closing parenthesis (like this). (A parenthetical sentence is punctuated within the parentheses.)
* A graph within a graph is an “inset”, not an “insert”. The word alternatively is preferred to the word “alternately” (unless you really mean something that alternates).
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* In your paper title, if the words “that uses” can accurately replace the word “using”, capitalize the “u”; if not, keep using lower-cased.
* Be aware of the different meanings of the homophones “affect” and “effect”, “complement” and “compliment”, “discreet” and “discrete”, “principal” and “principle”.
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1. G. Eason, B. Noble, and I. N. Sneddon, “On certain integrals of Lipschitz-Hankel type involving products of Bessel functions,” Phil. Trans. Roy. Soc. London, vol. A247, pp. 529–551, April 1955. *(references)*
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3. I. S. Jacobs and C. P. Bean, “Fine particles, thin films and exchange anisotropy,” in Magnetism, vol. III, G. T. Rado and H. Suhl, Eds. New York: Academic, 1963, pp. 271–350.
4. K. Elissa, “Title of paper if known,” unpublished.
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7. M. Young, The Technical Writer’s Handbook. Mill Valley, CA: University Science, 1989.

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