

10<sup>th</sup> March 2023



# ENGINEERING EXPLORATION



# KLE

## TECHNOLOGICAL UNIVERSITY

Creating Value, Leveraging Knowledge

(Incorporated under KLE Technological University Act-2012: Karnataka Act No. 22 of 2013, AICTE Approved)

Dr. M. S. Sheshgiri College of Engineering and Technology,  
Belagavi, Karnataka | Ph: 0831-2440322



**ENGINEERING EXPLORATION TEAM**



MESSAGE FROM

## Vice Chancellor



KLE Technological University' constituent college at Belagavi received the first batch of undergraduate engineering students affiliated to KLE Tech during 2021. A new learning phase post pandemic demands more student-centric learning method as students are switching from online to offline mode of learning the engineering curriculum. The passion and potential in these students were harnessed through the innovative learning environment at KLE Tech. As always, the students, through their dedication, demonstrated their skills with a new project-based learning approach. As the semester ends, we celebrated their resounding success in the first-year course Engineering Exploration course.

The first-year course - "Engineering Exploration", designed by the Centre for Engineering Education Research is one of the signature courses at this University. This course focuses on engineering problem solving, multi disciplinary skills required in Problem Solving and Teamwork.

In the very first year of the course delivery at KLE Tech. Belagavi campus, students from different Departments working with diverse group were opened to various ideas for solving the problem. The interactive sessions during the course helped the students to learn skills required for an engineering graduate. The practice of exhibiting students' projects at the end of the semester helps students learn from their peers.

The exhibition titled "Prayog Shishir 2023" is being conducted on March 10<sup>th</sup>, 2023 at the campus. This exhibition is going to showcase 65 course projects done by the first-year undergraduate engineering students of Mechanical Science stream.

I congratulate students and faculty members for showing how perseverance breeds success.

**DR. ASHOK S. SHETTAR**  
Vice-Chancellor,  
KLE Technological University, Hubballi.

# Engineering Exploration

@KLE MSSCET (KLE Tech, Belagavi Campus)

“Engineering Exploration” course is a unique innovation born in the educational ecosystem of KLE Tech.

This first-year course is co-designed and team taught by faculty members from multiple engineering disciplines. It focuses on problem solving, engineering design, multi-disciplinary skills, ethics and sustainability.

It follows PBL pedagogy and students work in teams to solve identified problems. All projects designed by students in this course are Arduino based and are built using several electrical and electronic components. The common actuators like DC motor, servo motor and stepper motors are used. Prayog is an exhibition conducted as a Prayog Shishir in the last week of odd semester.

It serves as a platform for peer learning and celebration of student' success.

**Total of 65 projects done by 260 first year students are being showcased in this event.**



MESSAGE FROM

## Principal



Engineering Exploration course is being implemented by KLE Technological University' Belagavi campus to encourage students to connect to real world engineering problems and offer innovative solutions by building products. The course offers students opportunity to experience entrepreneurial approach at first year level. By the time they complete undergraduate program students will have opportunities to convert these prototype products into commercial products and become successful entrepreneur. The main aim of this course is to explore ideas to transform knowledge into tangible objective, enhance teamwork and interpersonal skills, understand, and apply project management concepts and solve problems in society.

The first-year students have shown tremendous enthusiasm in this course learning and developed projects which are being exhibited on 10<sup>th</sup> March 2023.

I wish this event a grand success and congratulate students and faculty members for their continuous efforts.

**DR. BASAVARAJ G KATAGERI**

Principal  
KLE Dr. M. S. Sheshgiri College of  
Engineering & Technology, Belagavi



S.No.	CONTENT
1.	<b>CARD SHEET CUTTING MACHINE</b> College Xerox center needs a card sheet cutting machine that can cut the card sheet of the required size.
2.	<b>CUP CRUSHING MACHINE</b> There is a need for a cup-crushing machine in a tea shop to crush and dispose of used waste paper cups.
3.	<b>MAGIC GATE</b> A client needs a semi-automatic man-less gate at his/her entrance and/cum exit approach way, with due care that no one is harmed physically during its operation.
4.	<b>HOME AUTOMATION</b> A business owner needs a contactless, smartphone-controlled automatic door opening & closing system in his house, to prevent the spread of infectious diseases.
5.	<b>AUTOMATIC STICKER LABELING MACHINE</b> A pharmaceutical company needs an automatic Sticker labeling machine to label the tonic bottles and packaging cartons/boxes.
6.	<b>AUTOMATIC ITEMS DISPENSING MACHINE</b> Automatic dispensing machines have their own importance in this pandemic era. JG industry is involved in manufacturing such automatic dispensing machines. The company has received an order from a garage looking for a dispensing machine that can dispense items like keys, nuts, and bolts. Garage is looking for a automated solution
7.	<b>AUTOMATIC LOADING AND UNLOADING MACHINE</b> In a ARP company there is a need of loading and unloading of without much intervention of human
8.	<b>WHITEBOARD CLEANER</b> In a classroom, several whiteboards are mounted on walls or on stands. Design a solution to clean the whiteboard surfaces automatically.
9.	<b>RANGOLI DRAWING MACHINE</b> A boy in an upcoming Rangoli competition wants to show his talent of creating Rangoli with a robot.
10.	<b>AUTOMATIC MIXING MACHINE</b> The "Blend processor" industry is looking to design a Mixing machine that should be capable of mixing substances based on the need. (Industry, laboratory, construction, and food processing)
11.	<b>AUTOMATIC CUP CRUSHER MACHINE</b> A cafeteria/canteen is planning to dispose of its used cups to a disposal unit by crushing the cups to minimize the size of the cups during transportation. Design an automatic machine for the same.

## CARD SHEET CUTTING MACHINE

This work describes the design and fabrication of a card sheet cutting machine. The main components of this low-cost machine are an Arduino controller, DC motors, and motor drivers. The working of this system is based on source codes. Cutting perfect size card sheets by hand can now be done by machines too. Here we propose a semi-automatic card sheet cutting machine that can cut the required size card sheet with more accuracy. The proposed system makes use of an Arduino-based circuit that is interfaced with motors and belt based setup that is used to provide the mechanism needed by a blade to cut the card sheet. The Arduino-based circuit is interfaced with two DC Motors to transmit the movement commands as per the code fed to it. It then controls the cutting process through a well-controlled mechanism to achieve the task. One DC motor feeds the paper to the cutter and one d c motor slides the blade to cut the paper. The user will enter the data like how many strips of the required size need to be cut.



Engineering Exploration helped me to gain self-confidence and got to learn new things like different mechanisms and new software.

- Anupama Lad

In Engineering exploration, I learned how to work in a team and how to build a mechatronics device from mechanisms and software.

- Kalmesh Pujeri

## CUP CRUSHING MACHINE

The use of plastic/paper (use and through) cups is increasing day to day life in present scenario which cause a serious environmental issue, for this purpose we need to make eco-friendly environment by recycling possible waste plastic cups. As used cups are thrown in the dust bin, bin becomes full in a very short time. Objective of our project is to crush those used plastic cups before throwing into the bin, so that bin can hold more number of crushed cups. For this reason we are designing a cost effective cup crushing machine. This work describes the design and fabrication of a cup crushing machine. The main components of this low-cost machine are an Arduino controller, IR sensor, DC motors and motor drivers. The working of this system is based on source codes. The proposed system makes use of an Arduino-based circuit that is interfaced with IR sensor and motors based setup that is used to provide the mechanism needed by a rollers to crush the cups. The Arduino-based circuit is interfaced with two DC Motors to rotate the rollers as per the code fed to it. The cups placed between the rollers will be crushed and the crushed cups are collected in the bin.



Engineering exploration is such a course that makes the students bring up new Ideas in all possible ways. Here the guides are so supportive and dedicated, and they make the students level up themselves. Engineering exploration is a course like a seed for product development that in the future makes us capable to build even more such projects.

- Shantesh Sheelavantar

Engineering exploration exposes us to new concepts like the Engineering design process, the multi-disciplinary nature of engineering, problem-solving, data analysis, team building, sustainability, and project management. The best part of the exploration is it involves student-teacher interaction.

- Ziyallauh Konganole



## MAGIC GATE

The issue with the security guard at the entrance and/cum exit gate is commonly faced in a society building or railway level-crossing. Therefore, we intend to aid the security system at entrance and exit point(s) by introducing a man-less gate operation based on the sensor through a wide support of code. This code is programmed in such a way that the movement of the users becomes convenient, quick, and easy. The operation of the project is based on the detection of the object (user), once the user gets detected, the sound indication is activated with the operation of the complete set-up. The operation means, the opening and closing of the gate. The safety of the user is an important factor, which is been considered with a set of the performance test. The complete set-up or arrangement of different components is planned and located in consideration with easy and quick maintenance works. The project model is designed based on a problem-based learning approach of engineering exploration, through which it was easy to understand the problem and solve by mechatronic engineering skills through conceptual design, preliminary design, and physical implementation. This project is designed in view to have a practical implementation, which means practical problems that are likely to be faced is also been considered. The future scope of this engineering solution is that it can be made smart by connecting the system with an android application or a control room during an emergency.



This course has offered us great knowledge of self-esteem, teamwork, and project management with real-time constraints. We enjoyed this course with lots of enthusiasm and entertainment in the studio and the thinking lab.

-Pruthviraj Konti

Engineering Exploration was a great subject to learn about. It helps me a lot to learn about many different things and how things differ from the user's perspective.

-Sarvesh Shindolkar

## HOME AUTOMATION

This project mainly aims automatic door opening and closing system for industrial and domestic application, also this system is highly demanded and applicable project which can be used in offices, restaurant, malls, home, vehicle garage, etc. Nowadays technology is advancing day by day and with the help of electronic devices and is making our work easier. In the year 2020 human society faced the pandemic situation due to covid-19, humans were required to take precautionary measures such as to not touch anything, keep distancing, hand sanitizing etc. Humans constantly upgrade and improve performance working on automatic door opening and closing systems that support the process to be more productive and efficient. There are many technology invented by humans, some goes to the mall door opening and closing system, industrial door opening and closing system and garage door opening and closing system. Maintaining hygiene in any of the organization is very important. Here the system is designed in such a way that, it improves the accessibility and convenience of entry and exit points in buildings, such as supermarkets, hospitals, offices, and homes, by eliminating the need for manually opening & closing the doors, this technology offers a hands-free solution that promotes hygiene and reduces the spread of diseases, especially in highly crowded areas.



In exploring class I learned about new technologies and approaches, and I come to know about different machines and their working system.

-Sneha Raju Bakale

The exploration class was a whole new experience for me as a new and very interesting subject I learned many new and unique things from engineering exploration classes, like Teamwork.

-Gunjan Satish Madhumakkanahal

## AUTOMATIC STICKER LABELING MACHINE

The pharmaceutical industry is rapidly growing, and with it comes the need for efficient and reliable labeling solutions. An automatic sticker labeling machine using Arduino is a modern solution to meet this demand. This machine can label containers of different shapes and sizes, making it a versatile and convenient option for pharmaceutical companies. The proposed labeling machine is based on the Arduino platform, which is an open-source microcontroller platform widely used in various automation applications. The system is designed to be user-friendly and easy to operate, allowing for a simple and hassle-free labeling process. It uses a DC motor to move the container, conveyor and a label dispenser to apply the labels accurately. The machine is also equipped with a sensor system to detect the bottle/box position and adjust the label application accordingly. This feature ensures that the label is applied accurately, reducing the chances of error and wastage.

The proposed automatic sticker labeling machine using Arduino is a cost-effective and efficient solution for pharmaceutical companies. It eliminates the need for manual labeling, reduces the chances of error, and increases the production efficiency. It also allows for flexibility in labeling different types of containers, making it a versatile option for pharmaceutical companies of all sizes.



Engineering exploration helps us to deal with various types of machines. And working on those we can get a lot of knowledge. And to face the situation and deal with the machines.

-Abhishek



The engineering exploration course is based on teamwork. we learnt how to collaborate with team and for one problem there is many solutions learnt by team and this course. Thank you sir for a support on our project.

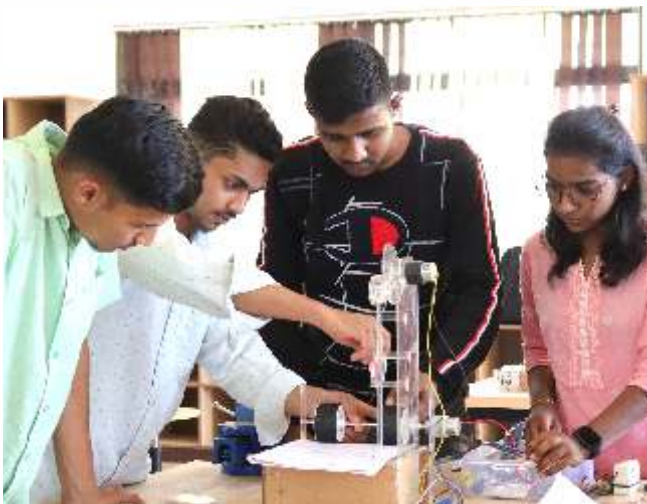
-Bhaskar G



## AUTOMATIC PAPER STAMPING MACHINE

A certificate stamping machine is a specialized type of stamping machine used to imprint official seals, logos, or other information onto certificates. It is commonly used in educational institutions, government agencies, and other organizations that issue certificates to individuals. The machine typically consists of an acrylic frame, a stamping mechanism, and an ink pad. To use the machine, the operator places the certificate under the stamping mechanism and presses down on a lever or button to imprint the stamp onto the document.

Certificate stamping machines come in a variety of sizes and designs to meet different needs and applications. Some machines are manually operated, while others are fully automated and can be integrated with digital systems for increased efficiency and accuracy. The use of certificate stamping machines is important for ensuring the authenticity and legitimacy of certificates. By imprinting official seals and logos onto these documents, institutions can prevent forgery and unauthorized alterations, as well as provide a clear record of when the document was issued.



Engineering Exploration has enriched my skills in creative thinking and problem-solving skills & working within a group and with other team members.

-Shashank M

The course has evolved through the combined effort of multi-disciplinary students in a team. And today we have learned so many good skills like problem-solving to multi-disciplinary, teamwork, and collaboration that can help in the future of our engineering studies

-Shravan Kenchanagoudra

## AUTOMATIC PAPER SHREDDING MACHINE

There will be general issues regarding confidential work in any private office like Colleges, Universities, banks, etc., In the Education system examination section work is been given the highest priority in the teaching-learning process. Generally, in University/College Exam office entry is having restrictions other than administrative people due to confidential work. For Ex. Question Papers preparation for the end semester exam is very much confidential work, where faculty/exam office staff must ensure that the questions should not be disclosed to anyone and it must be crushed well if it is not used for the exam. An unused Question paper or draft copy of the same must be shredded completely so that others cannot see it.

In this work, we have designed a prototype for an Automatic paper shredding machine for the examination section of KLE Technological University using an Arduino microcontroller, C Motors, and IR Sensors. The crushed paper pieces are stored in the storage and once the storage becomes full the user will get a buzzer sound for evacuating the paper pieces. This prototype machine work with an Electric power supply.



Engineering Exploration is an interesting course that helped us to know teamwork. It exposed us to Engineering Design for solving the problem.

– Praveen Kooge

This course gave me hands-on experience with different types of sensors and actuators along with how to work in a team.

-Ramchandra Gavade

## AUTOMATIC GARDENING MACHINE

Gardens, beautify and revitalize the energy in our surroundings; promoting peace and a sense of elation to human mankind. Group 8 and Group 4 have taken the initiative to design and build a machine. Our main Project Agenda is to build an automatic Gardening Machine which can help gardeners reduce their labor work and increase the efficiency of gardening. Our “Robo-Gardener” is designed to perform predominant tasks like maintaining a clean garden, cutting the grass to uniform lengths, collecting plant and organic waste, and shaping the grass to have a perfect finish. It operates by a controlled code and is made to run with the help of a built-in app through our mobile. In addition to this, the inclusion of an IR sensor makes it advanced as it can detect any kind of obstacle placed in front of it. Automatic Gardening Machine has several advantages over manual tools. It can cut the grass with precision and at a faster rate and consistently maintain the aesthetic environment of the garden. In all our automatic gardening machine is capable of multitasking. Moreover, it would be the best alternative in the future to shape and encourage an eco-friendly environment in colleges as it is pollution-free and a sustainable machine with less electricity consumption and 0 fuel consumption.



Engineering Exploration was an adventurous journey indulged with practical, analytical, and compassionate teamwork..

-Kriti Deshpande

Engineering Exploration was a very unique subject that helped me discover the new aspects and applications of engineering.

-Virupakshagouda Gorvi

## TEA PAPER CUP CRUSHING MACHINE

This machine presents the design and implementation of a crushing machine for recycling paper. The machine is designed to reduce the volume of paper cup waste by sensing the paper cup from other materials such as plastic, metal, and glass. The machine consists of numerous parts like blades, DC motor, acrylic sheets, trashcan, sensor, etc. The machine consists of three main parts a holding paper cup chamber, a crushing chamber, and a transferring waste chamber. The holding paper cup chamber is used to hold the cup. The crushing chamber is designed to crush the paper into smaller pieces, while the transferring waste chamber is designed to transfer the crushed paper cup waste to a trashcan. The paper cup crushing machine has the potential to improve waste management practices, particularly in settings where paper cups are used extensively, such as offices, cafeterias, and public spaces. By reducing the volume of the cups, the machine can also facilitate their transport to recycling facilities, where they can be processed into new products. Overall, this machine represents a promising solution to the environmental challenges associated with paper cup waste.



Engineering exploration was a great subject to learn about. It helps me a lot to learn about many different things and how things differ from the user's perspective. Every session had something new to do about learning, it was a fun learning subject.

- Ajinkya Anant Goundadkar

I think engineering exploration is a great way to learn about the world. It allows students to apply their knowledge from the classroom to real-world problems, and to think critically about how to solve them. Through exploration, students can develop a better understanding of engineering principles and how to apply them to create better solutions.

- Aditya Goddale

## COIN SORTING & COUNTING MACHINE

The systems are moving towards smarter ways to increase system utilization and effectiveness in this exciting era of new technological evolution. This work aims to design and develop a coin sorting device that can be used for a variety of related applications. In the retail industry, temples, and the public and private transportation sectors, coins are widely used. Manual sorting and counting are done in stores, which makes the labor more tedious and less precise and efficient. The goal of this effort is to reduce human effort while increasing the efficiency and use of the sorting and counting process. The project will involve designing and building a physical sorting mechanism, as well as programming the Arduino to control the motors and sensors. The machine will also include an LCD display to provide feedback to the user, such as the total value of the coins sorted. This project has the potential to be useful in a variety of fields, such as in retail, banking, or personal finance. The coin sorting machine could help to save time and reduce errors in the process of counting and sorting large quantities of coins. Additionally, the project provides hands-on learning experience in both hardware and software development, making it an excellent educational tool for students interested in robotics, automation, and programming.



“ The procedure has seemed surreal. Although extremely difficult and tiresome, we are learning as we go. The endeavor has been challenging in every way, and it has helped us see ourselves more clearly. ”

- Pratishta Verma

“ Exploration is a very interesting course and we are getting to learn many new things through it. The effects put by our mentors to get our projects complete is great. ”

- Nivedita



## SMART AGRICULTURAL SYSTEM

Are you looking for an innovative way to develop an efficient and sustainable agricultural system? Here we present you with a Smart Agriculture System that uses technology to enable agribusinesses and farmers to protect and grow their harvest better. By harnessing data from sensors and deploying a system that can irrigate, fertilize, and sow seeds in the field. This will help farmers use it to improve crop yields, cut costs, increase efficiency, and reduce environmental impact. Team H-13's first project, the "Seed drill," contributes to an effective and clever mechanism for planting seeds. Our second project, "Sprinklerize," from team H-14, helps with smart irrigation, while our third project, "Agri Guard," from team H-15, is a smart fertilizing system. Each project is created utilizing the high-end Arduino Mega 2560 microcontroller platform, which connects numerous sensors and actuators. The main components of the project's body are sheets of acrylic and foam. The working voltage is approximately 12 volts with a maximum current load of 2 A. The team-developed Android app serves as the project's management and control centre. These apps use Bluetooth connectivity to communicate with the main project body. This ambitious endeavor looks set to revolutionize agriculture by making it more intelligent and efficient than ever before!



Engineering exploration is an innovative and creative learning environment. Here I can explore and implement many circuits and mechanisms. This course helped me to build practical knowledge and develop my skills.

- Soumya H

The engineering exploration lab was very helpful to me. Activities done in the lab increased my creativity skills of me. The staff is also very knowledgeable and helpful in providing guidance and answering my doubts.

- Tejas Ghatge

## SMART TROLLEY SYSTEM

Shopping involves visiting a store, examining the products, taking the products, going through the billing section, standing in the long queue, scanning the products, calculating the total amount, and paying the bill either by cash or credit, or debit card. However, sometimes people do not find it enjoyable. According to the analysis, people struggle a lot during shopping. People want to make shopping much easier and more fun. In this way, it would attract more customers to the shop. So, we use RFID/QR CODE/IR sensor to bill the materials purchased in the shop or billing should happen in the trolley itself by the QR CODE scanner. In addition to this, they will be having a tough time searching for the products. Sometimes, they happen to lose the bill, since it is a physical entity. In our project model created, the customer can check their buying details on LCD (liquid crystal display) displays the essential information, ESP32 CAM will scan the QR code, or a load cell is used to sense the weight and with pre-installed data, it calculates price and displays through LCD. The shop owner can reduce the manual work. The movement of the trolley is through buttons or controlled by an app through Bluetooth and in a few cases the IR sensor helps in movement. If any obstacle comes in between the path then the trolley stops because of the ultrasonic sensor.



This course helped us understand peer learning and push ourselves in Multi-disciplinary design thinking in the first year itself

- Sukanya Savadatti

Exploration Engineering lab is an innovative learning environment designed to introduce students to the fields of engineering and technology. We explored a wide range of engineering concepts from robotics and computer programming to energy.

- Maithili Joshi

## INTERACTIVE TOY

Toys are means of fun for kids. In today's generation, there is a need for an interactive for kids which will provide them an opportunity to learn, spark their interest in learning and make learning interesting. The toy is designed in such a manner that it is portable. The material used here to create the design of the toy is acrylic and foam sheet. The movement of the toy is controlled with the help of a mobile app. This app can control the direction of the toy in forward, backward, left, and right directions. It is semiautomatic and has a robotic arm controlled through the servo motor. An Ultrasonic sensor that detects obstacles in distances ranging from 20 to 190cm. It includes the function of a mathematical calculator. The buttons of the calculator are placed on the toy. The calculation is performed when the user presses the button and the result is displayed on an LCD. The toy greets the user by playing the audio containing a description of the topic. In addition to the above function, the toy also plays rhymes. The rhymes are stored in the SD card module. The rhymes are stored in the SD card module (micro SD card) which allows the Arduino to read the SD card data.



Engineering exploration is such a wonderful experience, it was challenging, meaningful, and deeply fulfilling. Working on the project made me more active as a volunteer, coordination is the main key to achieving the result.

- Sanika Belgaonkar

Engineering exploration has helped us develop new products as a solution to problems. It has taught us about systematic approaches, research, and discovering new solutions. It has taught us management, creativity in designing our project, time management, etc. It has helped us identify areas of improvement and build our communication skills.

- Vinayak Naresh Gurav

## INDUSTRIAL ROBOT CONFIGURATION

Industrial robots are programmable machines that are designed to perform a range of tasks in industrial settings. These machines are typically used in manufacturing processes to carry out tasks that are repetitive, dangerous, or require high precision. The configuration of an industrial robot refers to its physical structure, including its number of axes, range of motion, and type of end effector. The most common configuration for industrial robots is a 3-axis articulated or jointed arm design, which allows for a high degree of flexibility in movement. The 3 axes refer to the number of joints that the robot has, which allow it to move in 3 different directions. These robots can typically carry a range of end effectors, such as grippers, welding torches, or cutting tools, depending on the specific application.

Another common configuration for industrial robots is the SCARA (Selective Compliance Articulated Robot Arm) design, which features four axes and is typically used for tasks that require a high degree of precision, such as assembly or inspection tasks. Cartesian or gantry robots are another types of industrial robot, which move linearly along three axes. These robots are often used in applications such as pick-and-place operations or material handling tasks. The cylindrical configuration robot is used for higher load-carrying capacity. It provides high rigidity to the manipulator. It is generally suitable for pick-and-place applications. Overall, the configuration of an industrial robot depends on the specific application and the requirements of the task it is designed to perform.



Through Engineering Exploration, we learned how to think out of the box for the solution. We learned and gained knowledge about various electrical and electronic components/devices such as sensors, actuators, etc.

- Snehal Gujjar

Engineering exploration for me worked as guide in my journey of engineering. It is a fusion of all branches coming together to make one project. I learnt many new things to mention a few about handling different machines. I was introduced to many new terminology such as Agile methodology, scrum, sprint. Exploration is interesting, interactive and practical subject.

- Yashaswi Nandgave

## AUTOMATIC STACKING MACHINE

The Automatic Stacking Machine for the industry is an exciting piece of technology that has the potential to revolutionize modern manufacturing. It uses advanced machine vision and sensing technologies, combined with a robotic arm or other mechanisms to automate the accurate stacking of objects, such as boxes, food, or parts, into desired load configurations. With this technology, robot-to-human collaboration is a reality and offers new opportunities for increased productivity. Not only does it help decrease staffing costs but also reduces lead time for production by streamlining processes like conveyor sorting and manual palletizing. On top of that, its built-in safety measures reduce any risks associated with manual handling labor and increase worker health & safety too! The "Cookie Jar", team I-4's first project, assists in stacking cookies or biscuits in the correct quantity. Our second project, "Magnetostacker," from team I-8, uses magnetic properties to help orderly stack screen nuts, and our third project, "EarthCon," from team I-12, is a mechanism used to stack big grain or rice sacks. Each project is created utilizing the high-end microcontroller platform Arduino Mega 2560, which connects several sensors and actuators. Acrylic and foam sheets make up the majority of the project's body. With a maximum 2 A current load, the operating voltage is close to 12 volts. The teams' own, in-house created Android app is used to oversee and control the whole project. With Bluetooth communication, these apps talk to the main project body.



The Engineering exploration course provided opportunities for hands-on learning and application of the engineering concepts learned in class. Overall had a good experience working in a team & learned coordination well.

- Chetan Belagavi

I enjoyed the entire sessions of exploration, especially while preparing the BOT and working through the app. I even learned how ethically an engineer should work. I enjoyed exploring new tools.

- Vaishnavi Kustagi

## SMART OFFICE ASSISTANT

The concept of a smart assistant involves the development of an autonomous robotic system that can perform a range of tasks related to material transportation within an office environment. The system will be equipped with sensors and computer vision technology to navigate its surroundings, identify objects, and avoid obstacles. It will also be able to load the necessary office materials, such as stationery, documents, devices, and refreshments, and transport them to their required destinations semi-autonomously. One of the main benefits of the smart assistant is its ability to significantly reduce the time and resources required for the manual transportation of office materials. It can perform tasks more quickly and consistently than humans, freeing up employees' time to focus on more complex and valuable tasks. Additionally, the smart assistant can help reduce the risk of errors or inconsistencies in transportation processes. The smart assistants we developed have a user-friendly interface, and also provide a level of convenience for employees. The use of a Controller, Bluetooth, DC Motors, and other electronic devices coupled together will help in the accomplishment of that. The user can effortlessly order their delivery material and control the device movement with an app or path follower. They can use the additional feature of a shredder for easy disposal of papers. A vacuum to maintain hygiene, A notepad for quick reminders and notifications throughout the office. To add value to the project, features such as self-obstacle avoidance, sensing the load on the machine and indicating sensors could be added to it. Successful implementation of this technology has the potential to revolutionize the way office materials are transported. The project will be critical in shaping the future of smart offices.



“ A good experience for project building, teamwork, and management

- Rasika Bandiwadkar ”

“ Learnt about engineering ethics and different sectors of the field

- Bhagyashree Biradar ”

## SMART CROWD CONTROL SYSTEM

In our two projects, there are two mechanisms used, the Conveyor Belt Mechanism and Pulley Mechanism (Like Elevator). They are equipped with ultrasonic sensors and have been developed to address the challenges of crowd management in various settings. The system is designed to efficiently move people through a specific area while ensuring their safety and comfort. The conveyor belt operates continuously, reducing the density of the crowd (ex: Temples) and on the other hand, the boarding and de-boarding system used in different applications, such as ships, is developed in the designed prototype. The sensors can accurately measure the distance between individuals which turns on the conveyor belt system. This information can be used to adjust the speed of the conveyor belt and ensure a smooth flow of people. The use of a conveyor belt system with ultrasonic sensors provides a sophisticated solution for crowd management that is both efficient and effective. Also reducing the risk of congestion and minimizing the likelihood of accidents. This makes it an ideal solution for managing large crowds at events, airports, and train stations, where safety and efficiency are most important. In another project we have developed a system that simulates a capsuled structure, is created, it uses a DC motor (60 rpm) to move between the top and bottom levels of the structure at appropriate speed and delay. DC motor movement solely depends on the number of people entering or exiting the elevator. The seven-segment display (SSD) shows the number of people entering and the same will be displayed on SSD. Here the limit of people who enter and exit is the same, that is 7. In future the additional functions/features could be added, the ultrasonic sensors integrated into the system, will monitor the flow of people and detect any disruptions or anomalies. The sensors can also alert security personnel to potential safety hazards, such as overcrowding or the presence of an object in the flow of people.



Engineering Exploration was not only about making a working model, we learned many lessons which will help us in our future life as an Engineer

- Aditya Koli

It was a good experience being a part of Engineering Exploration. We have learned a lot of things in Engineering Exploration lab

- Shreya Rokade

## MANGO HARVESTING MACHINE

Manual harvesting of mangoes is a slow & laborious process. In this Project, A prototype of a Mango harvesting machine has been built which improves harvesting capacity, cost efficiency, and less damage to the mangoes. The machine is user-friendly, capable to reach the high position of mangoes, and easy to operate. It is lightweight to be operated by a single person. The use of the controller, DC motors, servo motors, stepper motors, Bluetooth, and other electronic devices coupled together will help to accomplish the project. The machine is semi-automatic works on a power supply & does not cause any damage to mangoes while harvesting. This machine has an indicating unit that glows LED when the machine is "ON", the user can pluck the mangoes. There is storing unit present to store the plucked mangoes in a box, which is provided with the machine. This entire process is controlled via Bluetooth device & Mobile app. Once the connections are established, the data is transferred between the two devices. The HC-05 Bluetooth module uses a serial communication protocol, which means that data is sent in a stream of bytes. The data is transmitted wirelessly over the Bluetooth connections & is received by the other device i.e. harvesting machine. The use of collecting units, DC motors, servo motors, stepper motors & other electronic devices coupled together to help in the accomplishment of the task. With this project, we are addressing the technology used to build an alternative harvesting machine for farmers.



It's one of the best courses that I have studied till now; it teaches how to apply my learning to complete the project work professionally.

- Smruthi Rangain

Engineering exploration is one of the innovative courses which helped to develop communication skills, creativity, and teamwork. I enjoyed learning the engineering design process through activities.

- Anika Malige



## WEED REMOVAL MACHINE

The conventional weed removal process is very time-consuming and requires more labours. In this project, a prototype of a weed removal machine has been built to overcome this problem. The machine is semi-automatic, portable, user-friendly, and removes weeds effectively. It also collects the residual weed. The prototype is built by learning about various controllers, motors, their applications, and how to control them with codes and the Mobile app which runs on Bluetooth. The machine has 3 DC motors; 2 motors are for the movement of the machine and 1 motor is to rotate the cutting unit to cut the weed. These motors are controlled by the Mobile App which involves the start and stops of the blades and the movement of the machine. The blades for the cutting are placed below the base of the machine for safety purposes. A collecting unit is present, where the removed weed is collected in it. This machine is having two sensors, one is the ultrasonic sensor which detects the front obstacles and the other is the IR sensor which senses whether the collecting unit is full or not, These sensors give the signal to the user with the help of a buzzer. Once the buzzer beeps, the user can do his next step. As above mentioned this machine is operated using the mobile app, HC-05 Bluetooth module is used which connects the mobile to the machine and transfers the data.



I have learned a lot of things from engineering exploration. The engineering exploration course has thought me how to overcome real-world problems

- Vidya Shidlihal

Engineering exploration is one of the best courses that I have come across in my educational journey.

- Umarani Bharamanaikar

## AUTOMATIC DISPENSING MACHINE

Retailers in Belagavi have great reasons to get excited! A new vending machine initiative is in the works, offering convenience and accessibility for store patrons. The self-service system will feature a wide variety of items, from snacks and refreshments to hygiene products, which can be purchased with cash or card, making it perfect for both locals and tourists alike. With this set-up, shoppers can save time while they browse through retail stores: no need to go elsewhere for their needs! Team J-12's initial project, "SweetTooth," uses coins to distribute chocolates in the appropriate quantities. Our second project, "Kan-a-Can," from team J-13, helps to dispense soda and juice cans after receiving payment. Our last project, "Smart Pharma," from team J-14, is a device used to administer medication tablets by sensing the hand. Each project is created utilizing the high-end Arduino Mega 2560 microcontroller platform, which connects several sensors and actuators. The main components of the project's body are sheets of acrylic and foam. The working voltage is around 12 volts with a maximum current load of 2 A. The team-developed Android app serves as the project's management and control center. These apps use Bluetooth connection to communicate with the main project body. This is an exciting development not only for the customers but the entire business community in Belagavi!



“ The Engineering exploration course has helped me provide a starting point for understanding programming and mechanisms, which certainly will prove useful in my current project. ”

- Suhan Jamadar

“ The making of this project has helped me believe in teamwork and I am grateful to have gotten this opportunity to create something innovative. The great presentation style made this course enjoyable and informative. ”

- Shreya Patil

## BHEL MIXING MACHINE

The Bhel Mixing Machine is an innovative device designed for the efficient mixing of various ingredients used in making bhel, a popular Indian street food. This machine is constructed using lightweight and durable materials such as acrylic sheets, foam sheets, and aluminum rods as the structural material. The use of these materials ensures that the machine is strong, yet lightweight, making it easy to move and handle.

The machine is controlled by an Arduino Mega 2560 microcontroller, which allows for precise and accurate control of the mixing process. The microcontroller is connected to various electronic components such as sensors and motors, which are used to control the mixing speed and ensure uniform mixing of the ingredients.

The Bhel Mixing Machine is designed to mix various ingredients such as puffed rice, sev, chopped vegetables, chutneys, and spices in a specific ratio, as per the desired taste and texture of the bhel. The machine is equipped with a large mixing chamber, which can accommodate a significant amount of ingredients and has a transparent lid, allowing for easy monitoring of the mixing process.

Overall, the Bhel Mixing Machine is a highly efficient and user-friendly device, which can be used in commercial kitchens, food stalls, and restaurants. It simplifies the process of making bhel and ensures that the end product is of a consistent quality, which is sure to delight customers.



“ The engineering exploration course has been an amazing learning experience for me, and the Bhel mixing machine project was the highlight of the semester. It was great to be able to apply the engineering concepts we learned in class to a real-world project. ”

- Pratik Kesarkar

“ The engineering exploration course was an eye-opening experience, and the Bhel mixing machine project was a perfect example of how engineering can make a real difference in people's lives. It was a great opportunity to apply our knowledge to a meaningful project. ”

- Abhinandan Khare

## SPICE MIXING MACHINE

The Spice Mixing Machine is a state-of-the-art device designed for the precise mixing of various spices used in culinary preparations. The machine is constructed using high-quality materials such as acrylic sheets, foam sheets, and aluminum rods, which provide excellent structural strength and durability. The use of lightweight materials ensures that the machine is easy to handle and transport.

The Spice Mixing Machine is controlled by an Arduino Mega 2560 microcontroller, which allows for accurate and precise control of the mixing process. The microcontroller is connected to various electronic components such as sensors and motors, which are used to control the mixing speed and ensure uniform mixing of the spices.

The machine has a large mixing chamber, which can accommodate a significant amount of spices and has a transparent lid for easy monitoring of the mixing process. The machine is equipped with a user-friendly interface that allows the user to input the desired mixing time, speed, and ratio of spices.

The Spice Mixing Machine is an excellent addition to any commercial kitchen, food processing plant, or spice manufacturing facility. It simplifies the process of mixing spices, ensures consistency in the quality of the final product, and saves time and labor costs. The machine can be customized to meet the specific needs of the user, making it an ideal choice for spice mixers of all sizes.



The engineering exploration course was a perfect introduction to the world of engineering, and the Spice mixing machine project was a great example of how engineering can be used to create innovative solutions to everyday problems.

- Atharv Bathkande

I really appreciated the practical approach of the engineering exploration course, and the Spice mixing machine project was a great opportunity to apply what we learned in class to a real-world project.

- Sandesh Chavan

## HAY CUTTING MACHINE

Automation has become a crucial component of many industries, including agriculture, as the globe continues to advance.

Our team recently worked on a project to create an autonomous hay-cutting system that would save physical labor for farmers while simultaneously increasing efficiency. The automatic cutting device is made to mechanically cut hay, doing away with the necessity for a farmer to do it by hand.

An Arduino board, a microcontroller that can be programmed to control multiple electronic components, serves as the machine's central component.

The machine employs ultrasonic sensors to identify the hay and can automatically halt operation once the cutting is complete. The machine also has a stepper motor and a DC motor, which govern how the cutting blades move and how the grass moves forward. The device is simple to use and made to be operated by one person. The farmer merely needs to switch the equipment on and use his phone to operate it. The hay will be automatically chopped to the required length by the machine, improving cutting efficiency and lowering physical exertion. There are numerous potentials to further develop the machine in the project's huge future scope. One option is to add GPS technology, which would allow the machine to automatically travel and chop the field. A feedback mechanism that can keep track of the blades' condition and prevent them from getting worn out and lowering the machine's effectiveness is another option. We could have improved the project much further had we had additional time and resources.

We could have added more sensors, like a laser sensor, which can provide more accurate measurements than ultrasonic sensors, to increase the accuracy of the cutting length.

Also, we may use better, stronger, more durable materials to develop the project, ensuring its long-term durability.



Engineering Exploration helped us to learn many concepts like degrees of freedom, actuators, calculating the carbon footprint, etc, through which we can systematically frame our project. Also, we learned many mechanisms.

- Laxmi Hebballi

In Engineering exploration, we studied different things that can be used to make our project. For example, how to use MIT to control the machines etc.

- Pooja Patil

## MUNICIPAL WASTE CUTTING MACHINE

Due to the necessity for a sizable space for landfills, waste management has become a severe problem for many municipal corporations.

Thus, we plan to create an automatic cutting device that will automate the process of cutting waste to provide an effective solution for waste management.

A microcontroller, a DC motor attached to a rod holding blades, and an Infrared sensor are all components of this device.

The device works by utilizing a sensor to identify garbage, which then activates the DC motor to start the cutting process.

The garbage is chopped into manageable pieces for disposal by the motor rotating the rod-carrying blades.

The usage of this machine can contribute to a reduction in physical labor, the promotion of a cleaner environment, and the prevention of disease transmission.

The machine is affordable, simple to use, and maintain. It can also be quickly modified to match the unique needs of various places.

This is a sensible and effective waste management technique that can dramatically improve how clean and healthy cities are.



By reducing the volume of waste, waste-cutting machines can help businesses and municipalities save money on waste disposal costs, including landfill fees and transportation expenses.

- Bhakti Malwankar

Waste-cutting machines are designed to shred and reduce waste material including plastic, paper ..etc into smaller sizes. This makes it easier to transport and dispose of waste, as well as to recycle materials into new products.

- Vivekanand R

## AUTOMATIC MASSAGE MACHINE

Massage is the act of treating the body by rubbing, patting, or the like, as to stimulate circulation or relieve tension. A massager is a person or device that performs the massage. The device may be a simple mechanical device with fixed or movable parts or a mechanical device with electronic or electrical components. Massage may be performed by a person or a device that simulates or improves upon a person's act of massage.

A massaging device designed to provide relief to the muscles and tissues in the back, neck, head, shoulders & many parts of the body. It is used to reduce tension, alleviate pain, and promote relaxation. Massaging devices are available in various types, including handheld, chair-mounted, and cushion-mounted devices, each with their unique features and benefits. Overall, Massaging devices provide a convenient and effective way to relieve pain and promote overall well-being.

The Massaging device comprises of a hand-held housing that encloses an electric motor that may be battery operated. An eccentric weight is attached to the axle of the electric motor such that when the electric motor is activated, the eccentric weight will rotate and induce a vibration to the Massaging device.



Engineering exploration taught us more about microcontroller and automation of any Mechatronic system which was worth learning will definitely help us in building of our future projects.

- Sanika Uttarakar

The engineering exploration course gave us a great chance for us to work in a team and provided a better platform where we could explore a lot of things. It offered us enormous knowledge which will help us in the future. Thanks to all the staff members of this course for making this course more meaningful.

- Sudeep Koneri



The Supporting staffs helped us to get the shape of our virtual model to reality. They were very kind and excited while teaching us to run the machineries during Thinking Lab sessions.

- Prasad



The supporting staffs were like co-mentors for our students. They were found co-operative and helpful during all the sessions of Engineering Exploration for both students and teaching staffs.

– Prof. S. B. Kulkarni

## Unseen Hands of Exploration

As Engineering Exploration enters its First year of delivery, its also time to show our gratitude to our support staff for their relentless contribution to support student learning in the Engineering Exploration Learning Studio and Thinking Lab. From readying the mechatronic learning kits in the studio to helping students operate the tools and equipments in the Thinking Lab, the support staff have been the spine of this course.

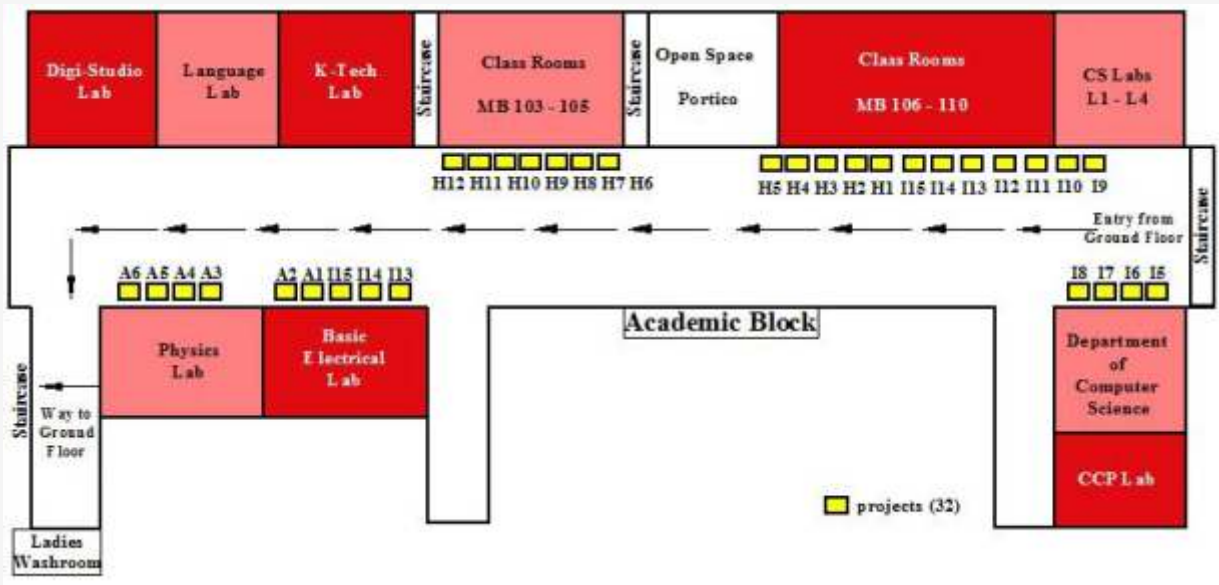
We thank them for their enthusiastic perseverance in contributing to successful student learning.



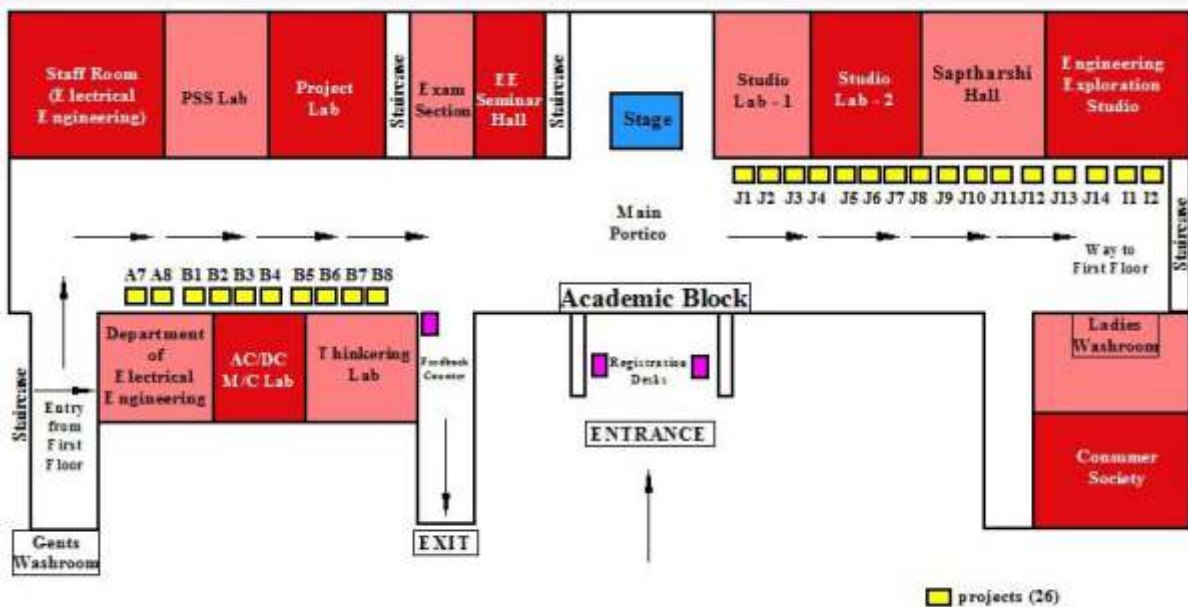
# PRAYOG

SHISHIR 23

## EXHIBITION LAYOUT - FIRST FLOOR



## EXHIBITION LAYOUT - GROUND FLOOR





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