

AUTOMATIC BUMPER IN FOUR WHEELER

A PROJECT REPORT

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M. KUMARASAMY COLLEGE OF ENGINEERING, KARUR

BONAFIDE CERTIFICATE

Certified that this project report “**AUTOMATIC BUMPER IN FOUR WHEELER**” is the bonafide work of “**RISHIKANTH M(927622BME069) SUJITH R(927622BME095) MUTHUSELVAN M(927622BME314)**” who carried out the project work during the academic year 2023 – 2024 under my supervision. Certified further, that to the best of my knowledge the work reported here in does not form part of any other project report or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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INTERNAL EXAMINER

EXTERNAL EXAMINER

DECLARATION

We affirm that the Project titled “**AUTOMATIC BUMPER IN FOUR WHEELER**” being submitted in partial fulfillment off or the End Semester Examination of **B.E. MECHANICAL ENGINEERING**, is the original work carried out by us. It has not formed the part of any other project or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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INSTITUTION VISION&MISSION

Vision

- ❖ To emerge as a leader among the top institutions in the field of technical education.

Mission

- ❖ Produce smart technocrats with empirical knowledge who can surmount the global challenges.
- ❖ Create a diverse, fully-engaged, learner-centric campus environment to provide quality education to the students.
- ❖ Maintain mutually beneficial partnerships with our alumni, industry and professional associations.

DEPARTMENT VISION, MISSION, PEO, PO & PSO

Vision

- ❖ To create globally recognized competent Mechanical engineers to work in multi-cultural environment.

Mission

- ❖ To impart quality education in the field of mechanical engineering and to enhance their skills, to pursue careers or enter into higher education in their area-of-interest.
- ❖ To establish a learner-centric atmosphere along with state-of-the-art research facility.
- ❖ To make collaboration with industries, distinguished research institution and to become a center of excellence

PROGRAM EDUCATIONAL OBJECTIVES(PEOS)

The graduates of Mechanical Engineering will be able to

- ❖ PEO1: Graduates of the program will accommodate insightful information of engineering principles necessary for the applications of engineering.
- ❖ PEO2: Graduates of the program will acquire knowledge of recent trends in technology and solve problem in industry.
- ❖ PEO3: Graduates of the program will have practical experience and interpersonal skills to work both in local and international environments.
- ❖ PEO4: Graduates of the program will possess creative professionalism, understand their ethical responsibility and committed towards society.

PROGRAM OUTCOMES

The following are the Program Outcomes of Engineering Graduates will be able to:

- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design / Development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary

environments.

12. Life - long learning: Recognize the need for, and have the preparation and ability to engage in independent and life -long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

The following are the Program Specific Outcomes of Engineering Graduates:

The students will demonstrate the abilities

- 1. Real world application:** To comprehend, analyze, design and develop innovative products and provide solutions for the real-life problems.
- 2. Multi-disciplinary areas:** To work collaboratively on multi-disciplinary areas and make quality projects.
- 3. Research oriented innovative ideas and methods:** To adopt modern tools, mathematical, scientific and engineering fundamentals required to solve industrial and societal problems.

Course Outcomes	At the end of this course, learners will be able to:	Knowledge Level
CO - 1	Identify the issues and challenges related to industry, society and environment.	Apply
CO - 2	Describe the identified problem and formulate the possible solutions.	Apply
CO - 3	Design / Fabricate new experimental set up/devices to provide solutions for the identified problems	Analyse
CO - 4	Prepare a detailed report describing the project outcome	Apply
CO - 5	Communicate outcome of the project and defend by making an effective oral presentation.	Apply

MAPPING OF PO & PSO WITH THE PROJECT OUTCOME

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO - 1	3	3	3	3	2	2	2	2	3	3	2	2	3	2	3
CO - 2	3	3	3	3	2	2	2	2	3	3	2	2	3	2	3
CO - 3	3	3	3	3	2	2	2	2	3	3	2	2	3	2	3
CO - 4	3	3	3	3	2	2	2	2	3	3	2	2	3	2	3
CO - 5	3	3	3	3	2	2	2	2	3	3	2	2	3	2	3

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ABSTRACT

The technology of pneumatic plays a major role in the field of automation and modern machine shops and space robots.. The aim is to design and develop a control system based intelligent electronically controlled automotive bumper activation and automatic braking system is called AUTOMATIC BUMPER IN FOUR WHEELER This project consists of IR transmitter and Receiver circuit, Control Unit, Pneumatic bumper system and pneumatic braking system. The IR sensor senses the obstacle. There is any obstacle closer to the vehicle (with in 3-4 feet), the control signal is given to the bumper activation system and also pneumatic braking system simultaneously. The pneumatic bumper and braking system is used to protect the man and vehicle. This bumper and braking activation system is only activated the vehicle speed above 30-40 km per hour. This vehicle speed is sensed by the proximity sensor and this signal is given to the control unit and pneumatic bumper and braking activation system.

CHAPTER 1

INTRODUCTION

We have pleasure in introducing our project “**AUTOMATIC BUMPER IN FOUR WHEELER**”. Which is fully equipped by IR sensors circuit and Pneumatic bumper and braking activation circuit? It is the project which has been fully equipped and designed for auto vehicles. The technology of pneumatic plays a major role in the field of automation and modern machine shops and space robots. The aim is to design and develop a control system based on intelligent electronically controlled automotive bumper activation system is called “automatic pneumatic bumper and break actuation before collision”. The project consists of IR transmitter and Receiver circuit, Control Unit, Pneumatic bumper system. The IR sensor senses the obstacle. There is any obstacle closer to the vehicle (within 1feet), the control signal is given to the bumper and break activation system. This bumper activation system is activated when the vehicle speed above 40-50 km per hour. The speed is sensed by the proximity sensor and this signal is transfer to the control unit and pneumatic bumper activation system.

CHAPTER 2

INTRODUCTION TO SAFETY SYSTEM

The aim is to design and develop a control system based on pneumatic braking system of an intelligent electronically controlled automotive braking system. for comparison of iterative technologies / techniques. The final phase of the new modern vehicle shall include: Development of improved ABS control systems Development and assessment of an electro-hydraulic- BBW (EH-BBW) system Individual wheel braking combined with traction control Assessing sensor failure and fault tolerant control system design Preliminary studies into an electrically actuated system Re-engineering using simplified models.

2.2 LITERATURE REVIEW

PNEUMATICS

The word 'pneuma' comes from Greek and means breather wind, for automation. Pneumatic systems operate on a supply of compressed air which must be made available in sufficient quantity and at a pressure to suit the capacity of the system. When the pneumatic system is being adopted for the first time, however it will indeed be necessary to deal with the question of compressed air supply the volume expressed is that of the air at intake conditions namely at atmosphere pressure and normal ambient temperature. The usual written as $PV = C$ (or) $P_1V_1 = P_2V_2$ In this equation the pressure is the absolute pressure which for free.

CHAPTER 3

WORKING PRINCIPLE

The compressed air from the compressor at the pressure of 5 to 7bar is passed through a pipe connected to the Solenoid valve with one input. The Solenoid Valve is actuated with Control Timing Unit. The Solenoid valve has two outputs and one input. The air entering into the input goes out through the two outputs when the timing control unit is actuated. Due to the high air pressure at the bottom of the piston, the air pressure below the piston is more than the pressure above the piston. So these moves the piston rod upwards which move up the effort are, which is pivoted by control unit. This force acting is passed on to punch/rivet which also moves downwards. The IR TRANSMITTER circuit is to transmit the Infra-Red rays. If any obstacle is there in a path, the Infra-Red rays reflected. This reflected Infra-Red rays are received by the receiver circuit is called “IR RECEIVER”. The IR receiver circuit receives the reflected IR rays and giving the control signal to the control circuit. The control circuit is used to activate the solenoid valve. The operating principle of solenoid valve is already explained in the above chapter If the solenoid valve is activated, the compressed air passes to the Single Acting Pneumatic Cylinder. The compressed air activates the pneumatic cylinder and moves the piston rod. If the piston moves forward, then the breaking arrangement activated. The breaking arrangement is used to break the wheel gradually or suddenly due to the piston movement. The breaking speed is varied by adjusting the valve is called “FLOW CONTROL VALVE”. In our project, we have to apply this breaking arrangement in one wheel as a model. The compressed air drawn from the compressor in our project. The compressed air flow through the Polyurethane tube to the flow control valve.

CHAPTER 4

MAJOR COMPONENTS

1. IR SENSOR
2. OPTICAL SENSOR
3. BRAKES
4. PNEUMATIC CYLINDER
5. WHEEL
6. SOLENOID VALVE

1. IR SENSOR

A sensor is a transducer used to make a measurement of a physical variable.

The picture can't be displayed.

2.OPTICAL SENSOR

Optical sensors are characterized specified by spectral, radiometric and geometric performance the spectral characteristics are spectral band and band width, the central wavelength, response sensitivity at the edges of band,



3.BRAKES

Brake is a mechanical device which inhibits motion, slowing or stopping a motion object or preventing its motion. Brake is generally applied to rotating axles or wheels, but may also take other form such as the surface of a moving fluid.



4.WHEEL

A **wheel** is a rotating component (typically circular in shape) that is intended to turn on an axle bearing. The wheel is one of the key components of the wheel and axle which is one of the six simple machines.



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5.PNEUMATIC CYLINDER

Pneumatic cylinder, also known as **air cylinder**, is a mechanical device which uses the power of compressed gas to produce a force in a reciprocating linear motion.



6.SOLENOID VALVE

A **solenoid valve** is an electromechanically operated valve. Solenoid valves differ in the characteristics of the electric current they use, the strength of the magnetic field they generate, the mechanism they use to regulate the fluid, and the type and characteristics of fluid they control.



CHAPTER 5

MANUFACTURING PROCESS

Manufacturing processes are the steps through which raw materials are transformed into a final product. The manufacturing process begins with the creation of the materials from which the design is made. These Manufacturing materials are then modified through manufacturing processes to become the required part. Manufacturing processes can include treating (such as heat treating or coating), machining, or reshaping the material. The manufacturing process also includes tests and checks for quality assurance during or after the manufacturing, and planning the production process prior to manufacturing.

CHAPTER 6

ADVANTAGES AND APPLICATIONS

Advantage

1. It able to Increase the sureness in braking system.
2. Braking system able to give fast response.
3. System able to increase the pre-crash safety.
4. System able to provide more safety to the passengers.
5. System plays an important role to save human
6. Life in road accidents.

Application

1. This system may be applicable in all types of light vehicles like cars, Rickshaws, Tempos
2. This system also successfully installed in the heavy vehicles like buses, trucks, trailers, etc.

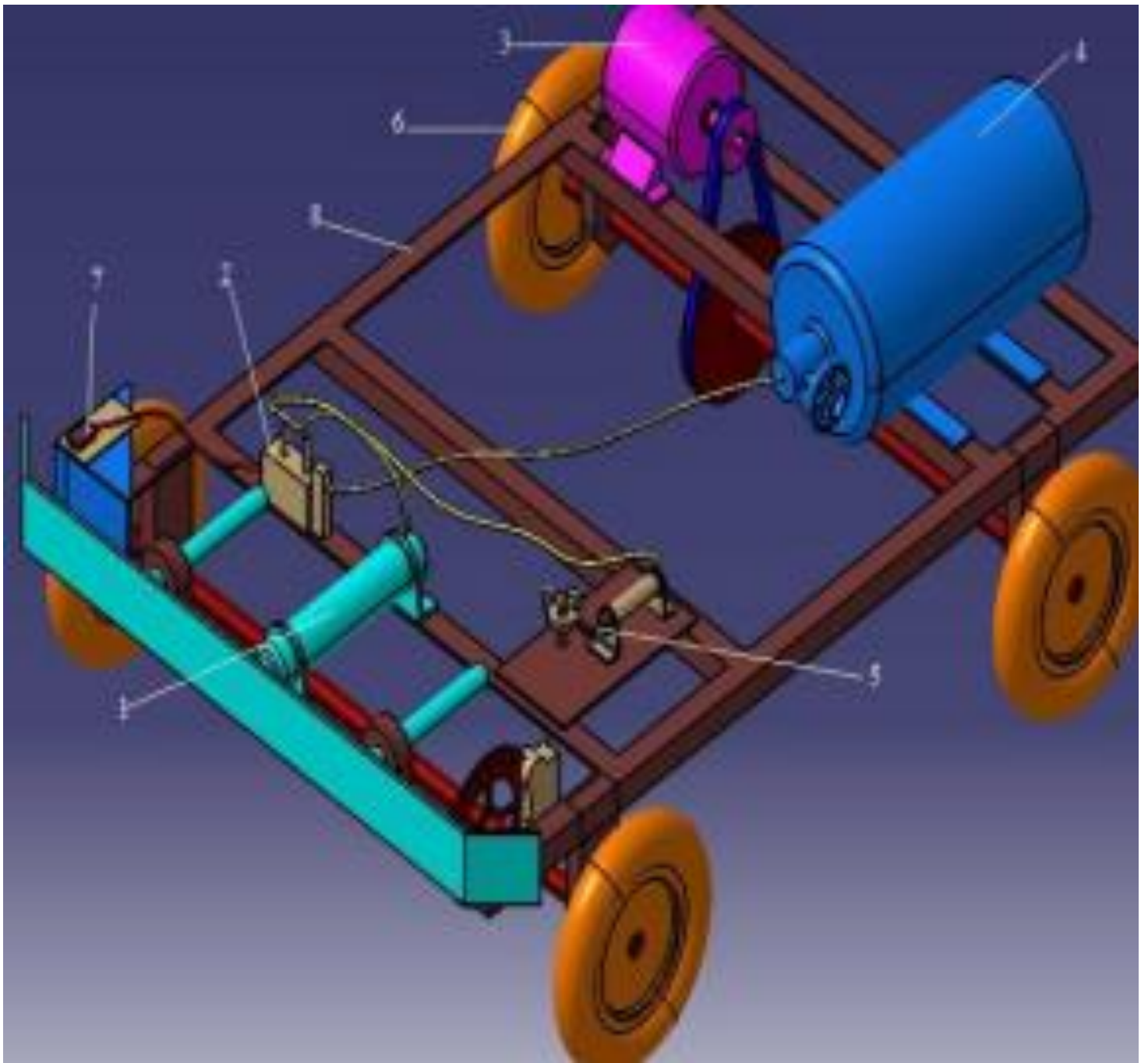
CHAPTER 6

Limitation

1. System has few limitations in densely traffic road.
2. System has no provision to prevent and cure the accidents from rear side of vehicle.
3. Hard and thick materials cannot be riveted.
4. Due to the linkages there will be frictional losses
5. Maintenance will be more due to the number of moving parts. 6. Stroke length is fixed.

CHAPTER 7

LAYOUTS OF MODEL



CHAPTER 8

CONCLUSION

This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We are feeling that we have completed the work within time successfully. The AUTOMATIC BUMPER IN FOUR WHEELER is working with satisfactory conditions. Thus we have prepared an “AUTOMATIC BUMPER IN FOUR WHEELER” which helps to know the how to achieve low cost product.

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