**Logo

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**FACULTY OF ENGINEERING**

**Senior2 Mechatronics Engineering program**

**Spring 2025**

**MCT445 – Mechatronics in Automotive Application**

**Lab (2)**

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# Introduction

* Anti-lock Braking System (ABS) is a crucial advancement in vehicle braking technology, designed to enhance safety, stability, and control during emergency braking situations. Traditional braking systems can cause wheel lockup under hard braking, leading to loss of steering control and increased stopping distances. ABS prevents wheel lockup by modulating brake pressure dynamically, ensuring optimal traction between the tires and the road surface.
* The ABS operates through a three-stage cycle: Hold, Increase, and Drop. In the Hold phase, the system maintains the current brake pressure when it detects an impending wheel lockup. If additional braking force is required, the Increase phase momentarily raises brake pressure to maximize stopping power. When excessive braking force is detected, the Drop phase reduces pressure to prevent wheel lockup and restore traction. This continuous cycle occurs multiple times per second, enabling controlled and effective braking performance.
* This report explores the effectiveness of ABS in preventing wheel lockup and maintaining vehicle stability. Through simulation and analysis, we assess braking efficiency, stopping distance, and stability under various road conditions. By comparing ABS to conventional braking, we highlight its advantages and discuss potential limitations in real-world applications.

# System Model

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## Control

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* Front

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* Rear

A diagram of a cell phone

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## Master Braking

A diagram of a circuit

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## Vehicle Model

A diagram of a computer

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# Results

## Manual Braking

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Distance = 97 m

Stopping time = 5.8 sec

## ABS Braking

A screenshot of a computer

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Distance = 72.3 m

Stopping time = 3.9 sec

Wheels’ acceleration

A screenshot of a graph

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# Work link

<https://drive.google.com/drive/folders/1RtEPQgRpflnOFlL6jwip4HNHhp_ZJ0sZ?usp=sharing>