

**TUGAS AKHIR**

**RANCANG BANGUN MOBIL LISTRIK KAMPUS  
UNAND**

Oleh:

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## ***ABSTRACT***

This final project aims to design, build, and test the performance of a 3000 W electric vehicle that is specially designed to operate on the hilly topography of Universitas Andalas. The background of this study is the need for a safe, efficient, and environmentally friendly campus transportation system, considering the campus road conditions that include uphill and downhill roads, as well as the importance of improving internal transportation safety.

The research methodology includes design, prototype development, and vehicle performance testing. The design process was carried out by preparing Design Requirement Objectives (DRO), Objective Tree Diagram (OTD), and House of Quality (HoQ), and by applying the Design for Manufacturing and Assembly (DFMA) method to ensure ease of production and assembly. The electric vehicle prototype uses a 3000 W BLDC motor, a 72 V 40 Ah lithium-ion battery, and a ladder frame chassis with a capacity of four passengers. The chassis strength analysis was performed using Finite Element Analysis (FEA) with static loading, which showed a maximum Von Mises stress of 9.352 MPa, still below the material yield strength, so the chassis is considered safe.

Performance testing was conducted in the Universitas Andalas campus area, including speed, driving range, and hill-climbing tests with variations in passenger mass. The test results show that an increase in passenger mass has a significant effect on vehicle performance. The maximum vehicle speed decreases as the load increases. These results indicate that the designed 3000 W electric vehicle can operate well on the Universitas Andalas campus topography, but its performance is strongly influenced by passenger mass.

**Keywords:** *Electric Vehicle, BLDC motor, DFMA, performance test, campus topography*

## ABSTRAK

Tugas akhir ini bertujuan untuk merancang, membangun, dan menguji kinerja mobil listrik berdaya 3000 W yang dirancang khusus untuk menghadapi kondisi topografi berbukit di lingkungan Universitas Andalas. Latar belakang penelitian didasarkan pada kebutuhan akan sarana transportasi kampus yang aman, efisien, dan ramah lingkungan, mengingat karakteristik jalan kampus yang menanjak dan menurun serta pentingnya peningkatan keselamatan transportasi internal.

Metodologi penelitian meliputi tahapan perancangan, pembangunan prototipe, dan pengujian kinerja kendaraan. Proses perancangan dilakukan dengan menyusun Design Requirement Objectives (DRO), Objective Tree Diagram (OTD), dan House of Quality (HoQ), serta menerapkan metode Design for Manufacturing and Assembly (DFMA) untuk memastikan kemudahan produksi dan perakitan. Prototipe mobil listrik menggunakan motor BLDC 3000 W, baterai lithium-ion 72 V 40 Ah, serta rangka ladder frame dengan kapasitas empat penumpang. Analisis kekuatan rangka dilakukan menggunakan metode Finite Element Analysis (FEA) dengan pembebanan statik, yang menunjukkan tegangan Von Mises maksimum sebesar 9,352 MPa, masih berada di bawah batas leleh material sehingga rangka dinyatakan aman.

Pengujian kinerja dilakukan di area kampus Universitas Andalas yang meliputi uji kecepatan, jarak tempuh, dan daya tanjak dengan variasi massa penumpang. Hasil pengujian menunjukkan bahwa peningkatan massa penumpang memberikan pengaruh signifikan terhadap performa kendaraan. Kecepatan maksimum kendaraan juga menurun seiring bertambahnya beban. Hasil ini menunjukkan bahwa mobil listrik 3000 W yang dirancang mampu beroperasi dengan baik di topografi kampus Universitas Andalas, namun performanya sangat dipengaruhi oleh massa penumpang.

**Kata kunci:** mobil listrik, motor BLDC, DFMA, uji kinerja, topografi kampus Universitas Andalas.