

# Field-Oriented Control of Induction Motors: Enhanced Performance and Efficiency

[Your Names]

Rajalakshmi Engineering College

May 1, 2024

# Introduction

- Induction motors are widely used in industry.
- Precise control is crucial for high-performance applications.
- Traditional scalar control methods have limitations.
- Field-Oriented Control (FOC) offers superior performance.

# Advantages of FOC

- Precise Torque and Speed Control
- Improved Efficiency
- Enhanced Dynamic Response
- Reduced Motor Stress

# FOC Block Diagram

- Coordinate Transformations
- PI Controllers
- Inverse Transformations
- PWM Generation

# Rotor Flux Angle Estimation

- Accurate estimation is critical.
- Sensorless vs. Sensor-based methods
- Trade-offs: Cost vs. Accuracy

# Project Overview

- Simulation and comparison of FOC and V/f control
- Analysis of output filter (OTT filter) impact
- MATLAB/Simulink environment

# MATLAB/Simulink Implementation

# Performance Comparison: Speed Response



# Performance Comparison: Torque Response

# Harmonic Distortion Analysis

# Conclusion

- FOC offers significant performance benefits.
- Simulation platform enables efficient design and analysis.
- Future work: Real-time implementation and sensor integration.

# Applications of FOC

- Electric Vehicles
- Robotics
- CNC Machines
- High-Performance Industrial Drives

# Thank You & Questions