**Design of a Modular, Direct-Drive Axial-flux PM Generator for Wind Turbine Applications**

**Chapter 1: Introduction**

-Background of Wind Energy Harvesting

-Problem Statement and Research Objective

-Thesis Outline

**Chapter 2: Review of Wind Energy Conversion(WEC) Systems**

-Power Equations

a) Power Coefficient

b) Tip Speed Ratio-TSR

c) Betz Limit

d) Wind profile and distributions

-Current Wind Turbine Systems

a)Mechanical aspects(drivetrains)

b)Electrical aspects(synchronous, induction)

-Flux orientations in PM based systems

-Importance of modularity in WEC Systems

**Chapter 3: Design of Proposed Generator**

-Mechanical and Electrical parameters

a)Sizing Equations

b)Geometrical paramaters

c)Phase turns, Phase resistance & inductance and air-gap

d)Volume and mass Equations

e) Losses

f)Power and Efficiency

- Electromagnetic Finite Element Analysis

**Chapter 4:** **Optimization and Design**

-Evolutionary Algorithms(EA) and Genetic Algorithm(GA)

-Genetic algorithms based optimization

a)Constants

b)Objective Function

c)Constraints

d)Independent variables

-MATLAB GA Toolbox implementation

-Design and Finite Element Analysis of a 5 MW AFPM generator with optimized parameters

-Comparison of the optimization results with FEA results

**Chapter 5: Conclusions and Future Work**

-MW-level commercial counterparts of designed generator

-Benchmarking

-Conclusion

-Future work

**References...........**