

TABLE OF CONTENTS

TITLE PAGE	I
APPROVAL PAGE	II
PLAGIARISM FREE STATEMENT	III
PREFACE	IV
TABLE OF CONTENTS	VI
LIST OF FIGURES	VIII
LIST OF TABLES	XIII
NOMENCLATURES	XV
Abstract	XVIII
CHAPTER I INTRODUCTION	1
1.1. Background	1
1.2. Problems Statement	7
1.3. Scope of the Problems	8
1.4. Research Purposes	8
1.5. Research Implications	9
CHAPTER II LITERATURE REVIEW	10
2.1. State of the Art	10
2.1.1. Effect of printing parameters on mechanical properties	10
2.1.2. Previous Reinforcement Methods	17
2.1.2.1. Continuous Fiber Reinforcement (CFR)	17
2.1.2.2. Short Fiber Reinforcement (SFR)	22
2.1.2.3. Powder Addition Reinforcement (PAR)	26
2.1.2.4. Vibration-assisted FFF (VA-FFF)	30
2.1.2.5. Annealing post-processing	32
2.1.3. Comparison of previous Reinforcement Methods	34
2.1.4. Research gap and novelty	36
2.2. Study of Literature	39

2.2.1. Deposition Process	39
2.2.1.1. Liquefaction	39
2.2.1.2. Extrusion process	40
2.2.1.3. Plotting	41
2.2.1.4. Cooling process	41
2.2.2. Composite	45
CHAPTER III RESEARCH METHODOLOGY	48
3.1. Research Stage	48
3.2. Experimental Setups	49
3.2.1. Materials	49
3.2.2. Tools	51
3.2.3. Specimens Fabrications	51
3.2.4. PLA Specimens	53
3.2.5. Development of Powder Addition Reinforcement (PAR)	55
3.3. Mechanical Testing	60
3.4. Morphology Test	61
CHAPTER IV RESULT AND DISCUSSION	63
4.1. Feasibility Study of Powder Delivery Method	63
4.2. Tensile Properties of PLA and PLA/Fe₃O₄	72
4.3. Flexural Properties of PLA and PLA/Fe₃O₄	79
4.4. Discussion	86
CHAPTER V CONCLUDING REMARKS	107
5.1. Conclusions	107
5.2. Rekomendations	108
5.3. Research Outcomes	108
REFERENCES	110