

## CONTENT

<b>APPROVAL PAGE .....</b>	<b>i</b>
<b>SELF DECLARATION AGAINST PLAGIARISM.....</b>	<b>ii</b>
<b>ABSTRACT .....</b>	<b>iii</b>
<b>PREFACE.....</b>	<b>iv</b>
<b>ACKNOWLEDGE.....</b>	<b>v</b>
<b>CONTENT .....</b>	<b>viii</b>
<b>LIST OF FIGURE.....</b>	<b>x</b>
<b>LIST OF TABLE.....</b>	<b>xx</b>
<b>CHAPTER I INTRODUCTION.....</b>	<b>1</b>
1.1    Background of the Problem .....	1
1.2    Problem Formulation.....	2
1.3    Objectives and Benefits .....	2
1.4    Problem Limitations.....	2
1.5    Research Contribution .....	3
1.6    Research Method.....	3
1.7    Research Methodology .....	4
1.8    Thesis Structure .....	6
<b>CHAPTER II BASIC CONCEPT .....</b>	<b>8</b>
2.1    Radio Detecting and Ranging (RADAR) .....	8
2.2    Radar Frequency Modulated Continuous Wave (FMCW) .....	9
2.3    Doppler Effect.....	12
2.4    Radar Drone .....	14
2.5    High-Pass Filter (HPF) in Respiratoion Detection Using Radar Drone .....	15
2.6    Scanning Method .....	16
2.7    State of the Art .....	18
<b>CHAPTER III PROPOSED METHOD.....</b>	<b>26</b>
3.1    Proposed Research .....	26

3.2	FMCW Radar to Detect Human Respiration Vital Sign Under the Ruins .....	27
3.3	Effect of Drone Height Fluctuation .....	31
3.4	FMCW Radar Drone to Detect Human Respiration Vital Sign Under the Ruins....	32
<b>CHAPTER IV RESEARCH METHODOLOGY .....</b>		<b>38</b>
4.1	Setup Experiment .....	38
4.2	Ruins modelling .....	39
4.3	Simulation Effect of Drone Height Fluctuation Modelling.....	39
4.4	Laboratory Experimental Fluctuation Model without Obstacle .....	40
4.5	Laboratory Experimental Fluctuation Model with Obstacle .....	41
4.6	Concept of Measuring Small Displacement Vital Signs with FMCW Radar Drone	42
<b>CHAPTER V RESULTS AND ANALYSIS .....</b>		<b>44</b>
5.1	Measurement Results with Simulation Models .....	44
5.2	Results of Laboratory Experimental Fluctuation Models without Obstacle .....	46
5.3	Results of Laboratory Experimental Fluctuation Models with Obstacle .....	49
5.3.1	Detection using Static Wood .....	49
5.3.2	Detection using Dynamic Wood .....	52
5.4	Results of Measuring Small Displacement Vital Signs with FMCW Radar Drone .	55
<b>BAB VI CONCLUSION.....</b>		<b>60</b>
6.1	Conclusion .....	60
6.2	Suggestion .....	61
<b>REFERENCE .....</b>		<b>62</b>
<b>APPENDIX A STATIC DATA .....</b>		<b>68</b>
<b>APPENDIX B DYNAMIC DATA .....</b>		<b>69</b>
<b>APPENDIX C MAGNITUDE RESPONSE OF LPF OUTPUT .....</b>		<b>71</b>
<b>APPENDIX D PHASE DETECTOR CUTOFF OUTPUT .....</b>		<b>83</b>
<b>APPENDIX E DETECTION RESULT .....</b>		<b>92</b>
<b>APPENDIX F BELT SENSOR OUTPUT .....</b>		<b>100</b>
<b>APPENDIX G HPF ORDE .....</b>		<b>114</b>