



**EFFECT OF LAYER THICKNESS ON  
REPEATABILITY OF 3D PRINTED PLA  
PRODUCED USING 3D ESPRESSO F220**

**MOHD IKMAL HISHAM BIN ABDUL RAHIM  
(2017282252)**

**BACHELOR OF MECHANICAL ENGINEERING  
(MANUFACTURING) (HONOURS)**

**UNIVERSITI TEKNOLOGI MARA (UiTM)**

**AUGUST 2020**

“I declared that this is the result of my own work except the ideas and summaries which I have clarified their sources. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any degree. “

Signed : .....

Date : .....

**Mohd Ikmal Hisham Bin Abdul Rahim**

UiTM No : 2017282252

“ I declared that I read this thesis and in our point of view this thesis is qualified in term of scope and quality for the purpose of awarding the Bachelor of Mechanical Engineering (Manufacturing)(Hons).”

Signed : .....

Date : .....

Supervisor or Project Advisor

**IR. NORMARIAH BINTI CHE MAIDEEN**

Faculty of Mechanical Engineering

Universiti Teknologi MARA (UiTM)

13500 Permatang Pauh

Pulau Pinang

## **ACKNOWLEDGEMENT**

First and foremost, I am grateful to the only one mighty creator, Allah SWT. With His will, I am able to complete my study in Bachelor of Mechanical Engineering (Manufacturing) (Hons) and completed this thesis.

Next, I would like to sincerely thank and appreciate my supervisor, IR. Normariah Binti Che Maideen for her time, great support, generous advice, assistance, patience and encouragement in project duration since the project started until its completion. Her great advice for my study proved monumental towards the success of this study. Without her persistent help, the goal of this project would not been achieved.

I also wish to express my deepest gratitude to Prof. Madya Ts. Dr. Mohd Mahadzir Mohammad @ Mahmood for his guidance, support and motivation throughout this semester, especially on this course. Deepest thank you also to my parents most sincerely for their continuous support, love and help in the project's completion.

Furthermore, wish to acknowledge the full support and assistance of Mr. Mohd Noor, 3D printer technician. Finally yet importantly, I would like to recognize the invaluable assistance of all people, directly or indirectly, whose assistance was a milestone in the completion of this work and thesis.

## **ABSTRACT**

Fused Deposition Modeling (FDM) categorized as additive manufacturing process, recognized as the simplest way to accomplish 3D printing. Studies indicate that FDM can be trust to create strong parts or prototypes. However, partial performance issues still exist, which this method must resolve to succeed the conventional manufacturing techniques. One of them is its variable repeatability performance that is debatable when it comes to producing separate runs of the same sample. Printing parameter is one of the factor that play a significant role on the variations of parts produced. In this study, a research was conducted to study the effect of layer thickness on repeatability of 3D printed PLA produced using 3D Espresso F220 machine. Layer thickness was chosen as variable parameter. Five samples of each dog bone (ASTM D638 Type I standard) and straight cut sample for 0.1mm, 0.2mm and 0.3mm layer thickness respectively were produced. The variations of the printed PLA sample determined based on the length, width, thickness and surface roughness reading that were measured and collected. Repeatability performance then been analyzed through One-way ANOVA analysis. This study did reveal that the layer thickness parameter does influence some dimensional quality and repeatability of sample produced. Dog bone's length having a better repeatability performance when layer thickness of (0.3mm) while for straight cut's thickness, using lower layer thickness of (0.1mm). This shows that variations in samples properties depends on not only one, but also every printing parameter involved. For each layer thickness, an ideal combination of printing parameter should be define to produce good sample quality. Thus, this study provide further information on the performance of 3D printing.