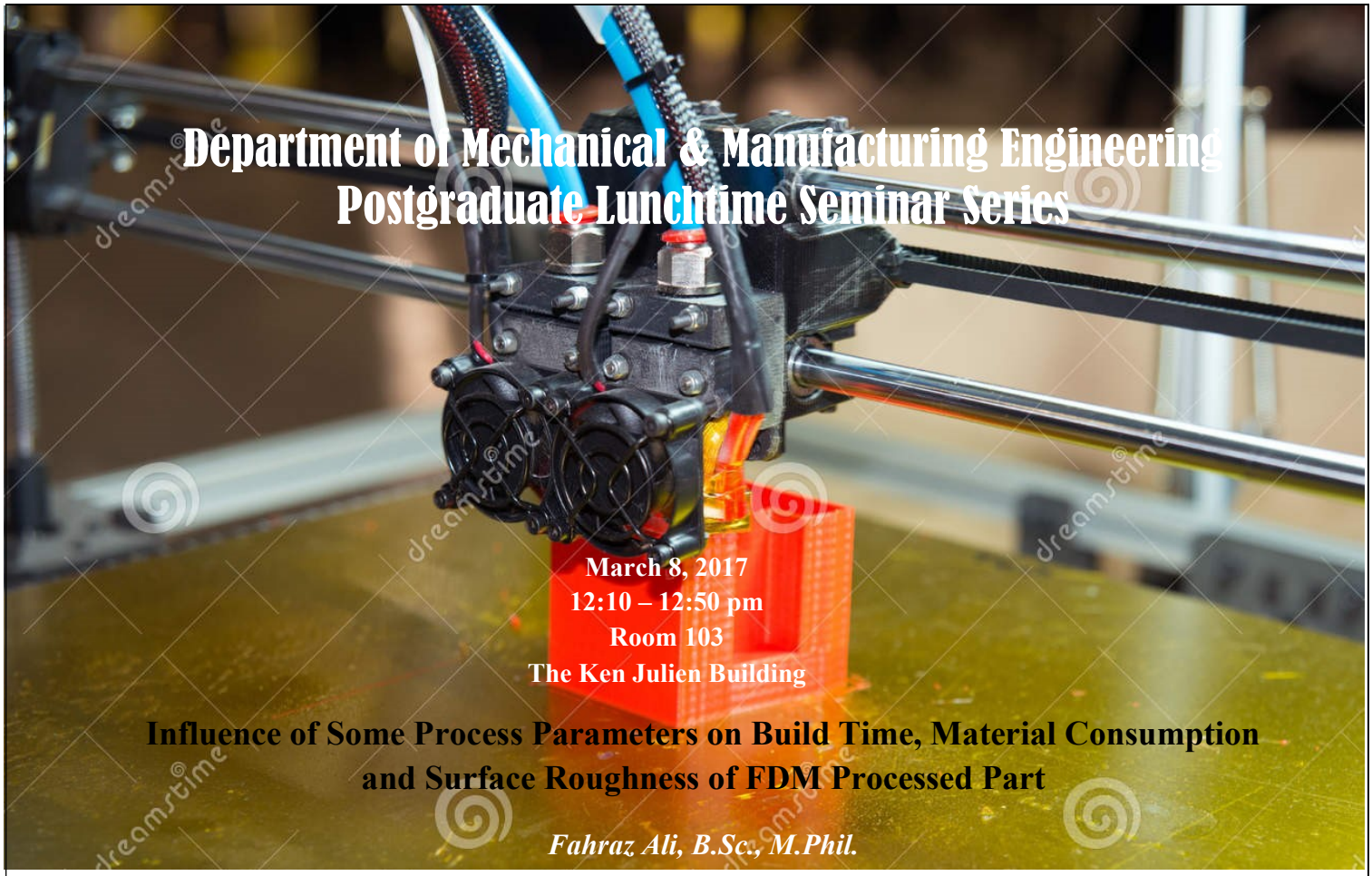

Department of Mechanical & Manufacturing Engineering
Postgraduate Lunchtime Seminar Series

March 8, 2017
12:10 – 12:50 pm
Room 103
The Ken Julien Building

Influence of Some Process Parameters on Build Time, Material Consumption and Surface Roughness of FDM Processed Part

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Abstract

The Rapid Prototyping (RP) paradigm has prompted the emergence of Rapid Manufacturing (RM) processes which have gained popularity for the development of parts, tools and dies as well as prototypes. Fused Deposition Modeling (FDM) is an important RP technique that forms physical objects from CAD generated solid or surface models using layer-by-layer deposition. RP is used to save time and cut costs at every stage of the product development process. A challenging research issue in RP arena is how to shorten the build time and improve the surface accuracy especially where numerous interactive process parameters are present.

In this research project, a parametric investigation will be performed for the evaluation of various process parameters such as layer thickness, build orientation, raster width, raster angle, number of contours, contour width, air gap, shrinkage factor, STL deviation and STL angle within a FDM process. Taguchi design of experiments approach as well as definitive screening design will be adopted and analytic tools such as main effect and analysis of variance (ANOVA) will be considered for impact assessment of the process parameters on performance measures which include build time, material consumption and surface roughness. Further, this study will be optimized and validated with the help of multi-objective algorithm and several prediction models. From this study, it has been observed that in order to minimize build time, larger layer thickness (0.2540 mm), larger raster width (0.6604 mm) and positive air gap was more effective. For minimizing support material consumption, smaller layer thickness (0.1778 mm) is recommended and for minimizing model material consumption, smaller layer thickness (0.1778 mm) and positive air gap is preferred. Furthermore, process parameters such as raster width, raster angle and air gap are critical to surface quality. These study outcomes' may help RP users in creating RP parts with a higher level of accuracy and by providing the means for generating smoother surface finish.