Notice of the Final Oral Examination
for the Degree of Master of Science

of

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BSc (Iran University of Science and Technology, 2013)

“Experimental Model for Predicting Cutting Forces in Machining Carbon Fiber Reinforced Polymer Composites”

Department of Mechanical Engineering

Tuesday, May 7, 2019
1:00 P.M.
Engineering Office Wing
Room 502

Supervisory Committee:
Dr. Keivan Ahmadi, Department of Mechanical Engineering, University of Victoria (Supervisor)
Dr. Afzal Suleman, Department of Mechanical Engineering, UVic (Member)

External Examiner:
Dr. Phalguni Mukhopadhyaya, Department of Civil Engineering, UVic

Chair of Oral Examination:
Dr. Fayez Gebali, Department of Electrical and Computer Engineering, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies
Abstract

The demand for materials with high mechanical performances such as Carbon Fiber Reinforced Plastics (CFRP) is increasing. However, there are major challenges in machining CFRP as it involves delamination, fiber pullouts, and extreme cutting tool wear. Analysis of chip formation mechanisms and prediction of associated cutting forces in CFRP machining enables one to address these challenges. This study proposes a mechanistic cutting force model for milling operations of the CFRP workpiece, considering its non-homogeneity and anisotropy, by taking into account variations of fiber cutting angle during machining. A mechanistic model of cutting force constants is obtained from a number of experimentally measured unidirectional CFRP milling forces. The obtained mechanistic force model predictions are verified against experimentally measured milling forces with arbitrary tool path indicating the accuracy of the proposed mechanistic model in predicting cutting forces. The proposed mechanistic cutting force model is capable of being integrated into the manufacturing process to allow optimized machining of quality certified CFRP work-pieces.