PROJECT TITLE: Variable Joint Design

FACULTY NAME: Dr. Philip Voglewede

STUDENT NAME: Clark Andrews

TIMEFRAME OF PROJECT: January 2014 – September 2014

RESEARCH SUMMARY: The objective of this project was to model jamming in a variable joint mechanism to predict functionality and improve the design. The variable joint mechanism studied consisted of a four bar system that transforms from a crank-crank to a crank-slider configuration. To model the jamming conditions of the variable joint, different types of jamming phenomenon were studied and explored. A “peg-in-hole” approach augmented with the quasi-static modeling approach of Whitney was used to develop the jamming conditions. This model was used to optimize the geometry of the variable joint mechanism using Matlab. From this optimization, the variable joint mechanism was redesigned and a prototype was fabricated. The prototype included an adjustable length bar to test the accuracy of the geometric optimization; it could be increased or decreased to observe the effect of length had on its functionality.

RESEARCH OUTCOME: The work was featured in a technical presentation at the Mechanisms and Robotics Conference in Buffalo, NY. The results will also be utilized in an upcoming journal paper submitted to the ASME Journal of Mechanisms and Robotics.

LOCATION OF RESEARCH ACTIVITIES: Work on the project was mainly performed in the Dynamics and Controls Laboratory (EH461) and some parts were fabricated in the DLL.

COLLEGE RESOURCES: The project used the 3-D printing resources of the DLL. It also utilized the computing resources of the Dynamics and Controls Laboratory.

COMMENTS: See action shots below.