Faculty of Engineering  
Summer Research Program 2022-2023  

Project Title: Effect of internal heart structures on blood flow  

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Objective  
To investigate the effects of the heart’s internal structures (trabeculae and papillary muscles) on left ventricular hemodynamics through experimental PIV (particle image velocimetry) measurements.  

Project Details  
The internal surfaces of heart ventricles are not smooth, but covered in rigid like structures called trabeculae. Papillary muscles also protrude from the heart wall towards the mitral valve. The project builds upon previous work which used medical CT scan data to reconstruct left ventricle geometries and construct a rigid PIV flow model. The project will include refining the model and collecting/analyzing PIV flow data. A primary output will be to determine the simplest geometry that can be used to accurately capture the flow structures for in-vitro or in-silico medical device (e.g. VADs) testing.  

Prerequisites  
Interest in experimental fluid mechanics, image reconstruction, imaging techniques and cardiovascular flows. Recommended MEC3451. Prior knowledge of the cardiovascular system is not required.  

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a) CAD model of the left heart reconstructed from CT imaging showing trabeculae ridges in the ventricle wall  
b) Schematic showing internal heart structures