

## MATERIALS ENGINEERING

### SEMINAR

#### **“Stimuli-Responsive Polymer Coatings Utilized in Smart Capsule for Targeted Sampling from Gastrointestinal Tract”**

By

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Purdue MSE Preliminary Exam

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#### ABSTRACT

The gastrointestinal (GI) tract has the main functions of digesting the ingested food, absorption of nutrients, and eliminating unwanted materials. Microbiomes throughout the entirety of the GI tract serve as an important community that can digest carbohydrates including dietary fiber and resistant starch that cannot be broken down by the body's enzymes. There is a high diversity in type and number of microbiomes throughout different sections of the gut i.e., their density increases from  $<10^3$  in the stomach to  $10^4$  in the small intestine and finally reaches the highest concentration in the colon with  $10^{12}$  CFU/mL. The density, as well as diversity of the bacteria, can fluctuate between individuals due to genetic, environmental, and dietary factors. Although there is plenty of evidence proving the links between imbalance/change in the host-microbiome matrix and intestinal diseases, current technologies have shown shortcomings associated with patient compliance or inaccuracy in reflecting the microbiome composition from the desired region in the gut. Hence, the design and development of a simple cost-effective ingestible capsule that provides sampling capability from the targeted location in the GI tract can open new possibilities for the prediction and management of diseases. The pH profile of the digestive tract as a natural physiological condition can be utilized to trigger the sampling activation mechanism at targeted regions. In this research, a systematic study of different single and multilayer pH-sensitive polymeric coatings was investigated as a potential stimuli-responsive coating on 3D-printed capsules that will initiate sampling at the desired sites of the small and large intestine, respectively.

**Date: Friday, May, 27, 2022**

**Time: 10:00am**

**Place: via WebEx link:**

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