Graduate Opportunities in Safe Transportation and Resilient Systems

Adviser:
Dr. Gilson Lomboy

GAANN- GOSTARS Fellowship Project

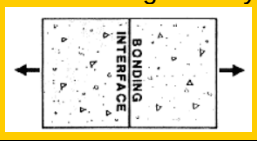
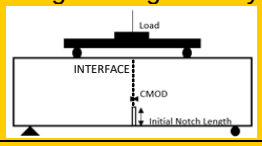
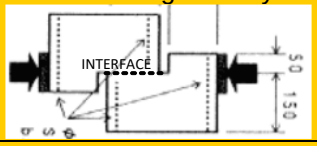
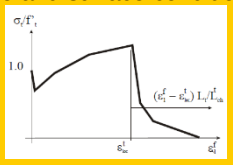
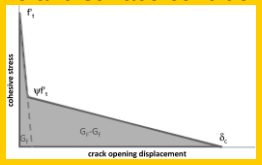
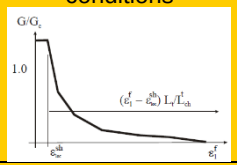
Title: Interaction and fracture of ultra-high performance concrete and high strength concrete composites

Description: In this project, fracture models for UHPC-HPC composites under different loading and bonding conditions will be studied. The models will consider stress and strain limits, fracture energy, stress intensity factors, and stress-crack width relationships. The models will be derived from physical experiments of tension, bending, and shear of composite specimens. Understanding the limit states of the composite will allow the analysis of failure modes of structures. This gives way to a better stress resistance for structures when subjected to loads and least damage should structures sustain excessive loads.

Impact on GAANN: Fostering expertise in concrete structure repair, rehabilitation, and replacement with UHPC will pave way to longer-lasting infrastructure due to the much greater strength and durability of UHPC compared to HPC and normal concrete. In greater utilization of UHPC in structures, faster construction and longer life spans can be achieved. Greater utilization with better understanding will promote more efficient use of the current state-of-the-art concrete materials.

Impact on GOSTAR: In studying how UHPC behaves in retrofit/repair and in new structures, the student will be well-positioned to address the problems of our aging infrastructure, as well as to update structures to serve future generations. The student will receive mentoring on research, teaching, and career during the program. The student will also have the opportunities to present in conferences and interact with experts in the field of cement-based materials.

Tentative Plan

Semester	1	2	3	4	5	6	7	8	9
Task	Tension Testing & Analysis 			Bending Testing & Analysis 			Shear Testing & Analysis 		
Outcome	fracture model under different size and surface conditions 			fracture model under different size and surface conditions 			fracture model under different size and surface conditions 		
Deliverable	Publish in a refereed conference proceedings and journal			Publish in a refereed conference proceedings and journal			Publish in a refereed conference proceedings and journal.		
Milestones	Dissertation committee	Qualifying exam							Graduation