Faculty Member Contact Information

Name	Alaa Elsisi
Contact Info	
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Department	Civil Engineering

1 Funded, 1 Unfunded URCA Assistant

	This position is **ONLY** open to students who have declared a major in this discipline.	
	This project deals with social justice issues.	
	This project deals with sustainability (green) issues.	
	This project deals with human health and wellness issues.	
	This project deals with community outreach.	
X	This mentor's project is interdisciplinary in nature.	

Are you willing to work with students from outside of your discipline? If yes, which other disciplines?

Yes

How many hours per week will your student(s) be required to work in this position?
(Minimum is 6 hours per week; typical is 9)

9

Will it be possible for your student(s) to earn course credit?

Location of research/creative activities:

Engineering Building

Brief description of the nature of the research/creative activity?

Composite steel construction plays a vital role in buildings and bridges due to its structural efficiency and ability to enhance load-carrying capacity. The interaction between steel beams and concrete slabs, facilitated by shear connectors, is essential for achieving full composite action. However, partial connectivity may arise due to design errors or when flexural strengthening of steel beams is required, leading to reduced structural performance. Strengthening the shear connectivity is crucial to restoring or improving composite action and ensuring structural integrity.

This project investigates the innovative use of bonded Carbon Fiber Reinforced Polymer (CFRP) strips to strengthen partial connectivity in composite steel beams. The creativity of this approach lies in leveraging CFRP's high strength-to-weight ratio and adhesive bonding capabilities to enhance shear interaction without intrusive retrofitting methods. Both experimental and numerical analyses are conducted to evaluate the effectiveness of CFRP strengthening in improving structural behavior. The experimental phase includes testing composite beam specimens with varying degrees of shear connection to assess their load response, stiffness, and failure modes. A finite element model is developed to simulate different strengthening scenarios and optimize CFRP application strategies. The findings of this research will contribute to the development of efficient and innovative retrofitting techniques, improving the performance and durability of composite steel structures.

Brief description of student responsibilities?

The URCA student will help in conducting experimental study to evaluate the effectiveness of bonded CFRP strips in strengthening partial shear connectivity in composite steel beams. Responsibilities include preparing beam specimens, applying CFRP, performing structural tests, and analyzing results. Additionally, the student will document findings and present conclusions, demonstrating creativity and technical proficiency while ensuring safety and collaboration.

URCA Assistant positions are designed to provide students with *research or creative activities* experience. As such, there should be measurable, appropriate outcome goals. What exactly should your student(s) have learned by the end of this experience?

Understanding of Composite Steel Construction – Gain a deep understanding of shear connectivity in composite beams and the impact of partial connectivity on structural performance.

Application of CFRP Strengthening – Learn how to effectively use bonded CFRP strips for strengthening shear interaction in composite structures.

Experimental Testing Skills – Develop hands-on experience in specimen preparation, structural testing, data collection, and result interpretation.

Technical Communication – Improve skills in analyzing results, writing technical reports, and presenting findings effectively.

<u>Requirements of Students</u>

If the position(s) require students to be available at certain times each week (as opposed to them being able to set their own hours) please indicate all required days and times:

If the location of the research/creative activities involves off campus work, must students provide their own transportation?

Transportation will be provided

Must students have taken any prerequisite classes? Please list classes and preferred grades:

CE 240

Other requirements or notes to applicants: