Faculty Member Contact Information

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Contact Info	
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1 Funded, 2 Unfunded URCA Assistants

X	This position is **ONLY** open to students who have declared a major in this discipline.	**M**
	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.	✋
	This mentor's project is interdisciplinary in nature.	I

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

- No

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)

- 8 hours

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

- No

Location of research/creative activities:

- Robotic Lab

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

In our robotic laboratory, we have acquired a FANUC LR Mate 200iD, a compact 6-axis robot. This addition significantly enhances our educational resources, particularly for courses such as MRE 454, ME 492, and MRE 480, providing our students with an invaluable opportunity to gain hands-on experience with an industrial-grade robot. Traditionaly, similar to many other industrial robots, FANUC employs its own unique structured text programming languages called 'teach pendant' (TP) and 'Karel.' Nowadays, these languages are not widely used in the broader robotic community, which typically relies on standard languages like Python and C++ that seamlessly integrate with the popular Robotic Operating System (ROS) platform.

In this project, we have two primary objectives: (I) Education and Outreach: Our first goal is to develop a concise workshop tailored for both undergraduate and graduate students. This workshop will focus on introducing our students to the FANUC robot and providing an overview of the teach pendant (TP) and Karel programming languages. The primary aim of this workshop is to attract more students to our robotic and mechatronics program, equipping them with valuable skills in robot programming. (II) Research: Currently, there is no FANUC support on ROS2, the next-generation of ROS, which is designed to be compatible with the Windows operating system. To address this limit, we plan to update the existing FANUC driver, written in C++ for ROS1, to make it compatible with ROS2. This update holds significant importance as it will enable the global robotic community to program the FANUC robot using widely-used languages such as C++ or Python within the popular Windows operating system, eliminating the need to grapple with less common languages like Karel.

Brief description of student responsibilities?

The student who gets involved in this project will get the chance to delve into the fundamentals of the Karel programming language, which includes understanding its basic structure, like different types and statements. As part of their tasks, the student will prepare a brief presentation for an upcoming workshop. This presentation will cover the essential operating instructions and include a demonstration of manually operating the robot.

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?

1) Using an actual factory robot and mastering how to write code for it using the programming language provided by the robot's maker.

2) Gaining a grasp of the fundamentals of ROS2 (Robot Operating System 2) and its framework.

3) Acquiring the skill of creating a tool that can convert code from one language to another.

Requirements of Students

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:

- Regular gatherings to discuss students' advancements and activities in the robotics lab on a weekly basis.

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

- No transportation required.

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

- It is recommended that students consider enrolling in ME492, Robotics Software Engineering using ROS.

Other requirements or notes to applicants:

- N/A