Faculty Member Contact Information

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Contact Info	
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Department	Civil Engineering

1 Funded, 2 Unfunded URCA Assistants

	This position is **ONLY** open to students who have declared a major in this discipline.	
	This project deals with social justice issues.	
X	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, Chemistry department

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 hours

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

- Yes-- CE492 - Geotechnical Research (3 credit hours)

Location of research/creative activities:

- Civil Engineering or Chemistry Labs

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

The research activity for this project would involve an evaluation of the aging characteristics of asphalt binder using Fourier Transform Infrared (FTIR) and Attenuated Total Reflectance (ATR) techniques. The study would aim to understand the chemical changes that occur in the asphalt binder as it ages, which can impact its performance and durability.

The first step in this research project would be to collect asphalt binder samples that have been aged under different conditions, such as exposure to ultraviolet radiation or high temperatures. These samples would then be analyzed using FTIR and ATR techniques.

FTIR analysis would involve shining infrared light on the asphalt binder samples and measuring the wavelengths of light absorbed by the material. This can provide information about the chemical bonds present in the sample, which can change as the binder ages.

ATR analysis, on the other hand, involves pressing the asphalt binder samples against a crystal surface and measuring the amount of light that is reflected back. This technique can provide information

about the surface properties of the sample and any changes that may occur as it ages.

The data collected through FTIR and ATR analysis would be analyzed to determine how the chemical composition and surface properties of the asphalt binder change with age. This information can then be used to develop models that predict the performance and durability of asphalt pavements over time.

Overall, this research project would contribute to our understanding of how asphalt binder ages and could inform the development of more durable and sustainable pavement materials.

Brief description of student responsibilities?

As a student participating in the research project involving evaluation of aging characteristics of

asphalt binder using FTIR and ATR techniques, there would be several responsibilities to undertake.

The following are some of the key responsibilities:

1. Sample collection: As a student, you would be responsible for assisting in the collection of asphalt binder samples. This may involve working with the research team to identify suitable locations and conditions for collecting aged asphalt binder samples.

2. Sample preparation: Once the samples have been collected, you would be responsible for assisting in their preparation for analysis. This may include tasks such as cleaning, drying, and grinding the samples to ensure they are suitable for FTIR and ATR analysis.

3. Data collection: As part of the research team, you would be responsible for assisting in the FTIR and ATR analysis of the asphalt binder samples. This would involve operating the equipment used for the analysis, collecting and recording data, and ensuring that the samples are analyzed accurately and efficiently.

4. Data analysis: After collecting data, you would be responsible for assisting in the analysis of the results. This may include tasks such as compiling data, running statistical analyses, and preparing visualizations to help interpret the data.

5. Report writing: Finally, you would be responsible for contributing to the writing of the research

report. This may involve drafting sections of the report, reviewing and editing other team members' contributions, and ensuring that the report is well-organized, accurate, and effectively communicates the research findings.

Overall, as a student participating in this research project, you would have the opportunity to gain valuable experience in various aspects of the research process, including sample collection and preparation, data collection and analysis, and report writing.

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?

By the end of this research experience, students should have gained a range of knowledge and skills related to asphalt binder evaluation using FTIR and ATR techniques, as well as the broader research process. Specifically, they should have:

1. Developed a strong understanding of the principles behind FTIR and ATR analysis, including how the techniques can be used to evaluate the aging characteristics of asphalt binder.

2. Gained practical experience in sample collection, preparation, and analysis using FTIR and ATR equipment.

3. Developed skills in data collection and analysis, including how to effectively collect, organize, and interpret data from FTIR and ATR analyses.

4. Learned how to work collaboratively as part of a research team, including how to communicate effectively with team members, contribute to a shared research project, and work towards common research goals.

5. Developed critical thinking and problem-solving skills, particularly with respect to identifying research questions, designing experiments, and interpreting results.

6. Developed technical writing skills, including how to write effectively and persuasively in a scientific context, and how to communicate research findings to different audiences.

Overall, this research experience should provide students with a range of valuable skills and knowledge that can be applied in a range of future research contexts.

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:

- N/A

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

- N/A

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

- N/A

Other requirements or notes to applicants:

- N/A