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National Summer Transportation Institute Program

The College of Engineering hosts an innovative summer program to encourage women and minority high school students to pursue higher education in science, technology, engineering and mathematics (STEM) fields.

The College of Engineering is proud to have hosted U.S. Department of Transportation National Summer Transportation Institute (NSTI) programs during 2015-2017. These transportation-focused academic enhancement programs are held at various universities and colleges around the country, and they aim to introduce middle school or high school students to transportation-focused careers. In particular, their goal is to recruit, promote and encourage the participation of minorities and women in the science and engineering disciplines.

The College's program was established by Ali Ghahremaninezhad, assistant professor in the College's Department of Civil, Architectural and Environmental Engineering. He has extensive expertise in nanotechnology and innovative approaches for sustainable transportation infrastructure materials. The College's program is in partnership with the state of Florida Department of Transportation, which also helped fund it. Held under the auspices of the DOT's Federal Highway Administration Headquarters' Civil Rights Office, it brings 20 to 30 high school students to the College for a two-week summer program.

Students in the NSTI program benefit from the College's high-tech resources, including the Advanced Materials Research Laboratory and Structures and Materials Laboratory, which help them understand innovative and smart construction materials such as bacteria-assisted self-healing concrete. In the lab, students engage in hands-on activities, preparing concrete modified with nanomaterials, casting concrete cylinders and testing them for compressive strength. At the University's Microscopy Center, students look at minuscule particles, from nano to microscale, found in construction materials.

"Research and technology have created tremendous increases in jobs and production in the U.S., as well as opportunities for export and international leadership. But, maintaining the nation's international competitiveness depends on future generations," says Ghahremaninezhad, who is director of the program. "The NSTI Program is one way that the U.S. invests resources to develop a better-educated society that can produce technology advancements."

Minorities and women are currently underrepresented in STEM fields. *U.S. News and World Report* concluded that historically underrepresented racial and ethnic groups account for 27% of the general population, yet only 10% of the country's science and engineering workers. According to data from the National Science Foundation and the U.S. Census Bureau, underrepresented minorities earn about 18% of total undergraduate degrees from four-year colleges, yet fewer than 13% of those degrees are in the physical sciences and engineering. A similar pattern occurs with women in the STEM disciplines. While women represent about half of this country's population, they represent only around 28% of the science and engineering workforce.

The same is true in construction as well. According to the U.S. Department of Transportation, minorities own only 9% of U.S. construction firms and women own a mere 2.5%.

Ghahremaninezhad saw an opportunity for the College to take advantage of the University of Miami's existing efforts to recruit and engage minorities and women, including active chapters of the Society of Hispanic Professional Engineers and Society of Women Engineers. "The NSTI program allows us to reach women and minorities *before* they matriculate at universities," he says. "Establishing this program in 2015 was a giant step toward bringing more women and minorities into the STEM fields."

He further explains: "NSTI encourages high school students toward STEM disciplines by opening them up to the principles, challenges and opportunities in the STEM fields."

Since the College's program began in 2015, 50 Miami-Dade high school students have participated in lessons, teamwork, group activities, competitions and field trips, which create an awareness of transportation engineering and its career opportunities. They are encouraged to apply engineering principles to strengthen their capabilities in understanding of mathematics, science, reading, writing and leadership. "The summer experience will be far more valuable than coursework familiarity," says Ghahremaninezhad. Ultimately, NSTI helps students become well-rounded individuals who can excel in the STEM and transportation industry fields.

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