



UTCRS SPRING 2017 NEWSLETTER ISSUE 3



A MESSAGE FROM THE DIRECTOR

Constantine Tarawneh, Ph.D., Bentsen Fellow



Over the past year, our faculty, staff, and students have been actively engaged in the various research, education, workforce development, technology transfer, and community outreach activities of the University Transportation Center for Railway Safety (UTCRS). In research, the UTCRS finished approving the final set of projects under the 2013 UTC Competition grant. In total, the UTCRS has funded 36 different projects at the three consortium institutions since 2013. Fourteen of these projects have already completed the outlined goals and objectives, with the remaining 22 ongoing projects set to complete by no later than summer of 2018. The projects have yielded several impactful products that serve to enhance the safety of operations on our nation's railways.

In education, the 2016 UTCRS Research Experience for Undergraduates (REU) Program engaged 14 students in the various ongoing projects at the consortium institutions, bringing the total number of students served by the UTCRS REU Program to 35 since 2014. The number of students who go on to pursue Master's degrees in transportation-related fields measures the success of the REU Program. To date, 25 of the 35 REU students are either already enrolled or have been accepted into graduate programs at the three consortium institutions pursuing Master's degrees in transportation-related fields. The UTCRS 71% admission to graduate programs as a result of participation in an REU Program is well above the national average of these programs. This percentage is expected to slightly increase as some of the remaining REU student participants are still completing their undergraduate degrees. Moreover, the UTCRS also celebrated the accomplishments of several of the undergraduate and graduate students who have been an integral part of the day-to-day activities of the UTCRS. One example is the 2016 UTCRS Student of the Year, Mr. Oscar Rodriguez, who has co-authored two papers as lead and presenting author at the ASME Joint Rail Conference. He has been awarded two ASME scholarships in two consecutive years as undergraduate and graduate student. We are very proud of all our students who have demonstrated great leadership traits and outstanding work ethic.

In workforce development, the UTCRS ran a very successful K-12 STEM Teacher National Workshop that attracted 100 teachers to the UTRGV campus, where a two-day workshop was held to train teachers and STEM program coordinators on the use and implementation of the UTCRS developed transportation-related STEM curricula. The UTCRS will be holding this workshop again this year on June 3, 2017. To date, the UTCRS STEM workshops have trained more than 300 teachers on the use of the transportation-related modules and curricula over the past three years. Many of these teachers are actively implementing this curriculum in their classes on a regular basis, and the UTCRS faculty, staff, and students work with these teachers to facilitate the implementation. In technology transfer, the UTCRS has disseminated the results of the performed research through nine conference papers, ten master's theses, and numerous posters and presentations at four different undergraduate and graduate research symposiums. Moreover, several of the UTCRS products can be found in our website.

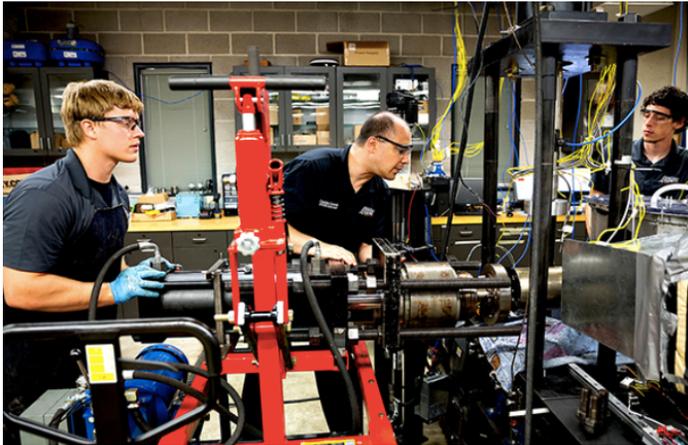
Lastly, the UTCRS community outreach activities have continued to impact the entire Rio Grande Valley (RGV) through the Railway Safety Summer Camps that served more than 1300 students in summer 2016. The closing ceremony attracted more than 1200 community members who helped us celebrate the many accomplishments of our K-12 students, highlighted by our keynote speaker, former U.S. Congressman Rubén Hinojosa. To date, the UTCRS Summer Camps have served more than 3000 students engaged in transportation-related STEM curricula over the past three summers. This year, funding for these camps is being generously provided by the local school districts that have seen first-hand the positive impact of these summer camps on the performance and engagement of their students in STEM fields. The UTCRS Summer Camps are the largest transportation-related STEM camps in the nation, a fact that is one of several points of pride for the UTCRS. This newsletter highlights some of the UTCRS activities and accomplishments over the past year.

NEWS CENTRAL



OSCAR RODRIGUEZ - 2016 UTCRS STUDENT OF THE YEAR AWARD RECIPIENT

2016 Student of the Year Award Recipient Mr. Oscar Rodriguez alongside UTCRS Director, Constantine Tarawneh. The Council of University Transportation Centers (CUTC) celebrated their 20th banquet and reception on January 9, 2017. This is the 26th year of honoring distinguished students and faculty. Mr. Rodriguez has also been named the 2016-2017 most outstanding graduate student by the vote of the mechanical engineering faculty at UTRGV, and is the recipient of two consecutive ASME Scholarships for submitting and presenting two papers at the 2016 and 2017 ASME Joint Rail Conference.



RAILWAY SAFETY STUDENTS STAY ON TRACK FOR ENGINEERING CAREERS

Since its inception in Fall 2013, the University Transportation Center for Railway Safety (UTCRS) has provided many students the opportunity to transition from two-year Associates Degrees to four-year Bachelor's in Engineering programs and prepared these students for their graduate studies. Some of these students have since graduated with their Master's degrees in Mechanical Engineering, some are still pursuing their Master's degrees, and some are finishing their Bachelor's degrees. This successful academic pipeline has provided an excellent recruitment tool and model to follow for high school students that are part of dual-enrollment programs with local community colleges in the Rio Grande Valley.



RAILWAY SAFETY SUMMER CAMPS HOST 1,250 STUDENTS, ELEMENTARY TO HIGH SCHOOL

In summer 2016, 1,250 students from elementary to high school built LEGO robots, magnetic levitating trains and bumper cars to learn the important roles that science, technology, engineering and mathematics (STEM) fields play in creating safe transportation. UTRGV held its third University Transportation Center for Railway Safety (UTCRS) Summer Camps from June 6-July 8 on the Edinburg Campus. The five-week camps are the largest STEM-related camps ever held at UTRGV and the largest transportation-related summer camps in the nation. Each week, a different group of students from area districts participate, with an average of 250 students attending each week.

[...READ MORE](#)



2017 STEM TEACHER NATIONAL WORKSHOP

The 2017 UTCRS K-12 STEM Teacher National Workshop is an excellent opportunity for K-12 Educators, STEM Learning Coordinators, CTE Directors, Transportation and Railway Safety Educators, and Summer Camp Coordinators to learn how to incorporate Transportation Engineering in the classroom as a way to deliver STEM concepts at all grade levels.

For more details on this workshop, including an agenda of all the planned activities, and to register, please visit us at

<http://www.utrgv.edu/railwaysafety/workforce/professional-workshops/2017%20stem%20teacher%20workshop/index.htm>

FY16-17 RESEARCH PROJECTS SELECTED FOR FUNDING BY UTCRS

Since its inception in Fall of 2013, the University Transportation Center for Railway Safety (UTCRS) has issued several calls for proposals as part of the process to select the projects that will be funded through the center. The research focus areas were vetted by the center’s advisory board and are categorized under railway mechanical systems, railway infrastructure systems, and railway operation systems. Each partner institution oversees projects in only one of the aforementioned three categories. The University of Texas Rio Grande Valley (UTRGV) research projects are aimed at tackling railway mechanical systems; Texas A&M University (TAMU) research projects are focused on railway infrastructure systems; and the University of Nebraska-Lincoln (UNL) oversees projects related to railway operation systems.

In FY16-17, the UTCRS finalized the selection of 18 new projects that will be completed by August of 2018. To date, the UTCRS has funded 36 different projects covering a broad range of railway safety issues that are relevant to the railroad industry. Of the 36 projects, 11 cover railway mechanical systems, 13 cover railway infrastructure systems, and 12 cover railway operation systems. Final reports on the projects that already completed have been posted on the UTCRS website and indexed on TRID. For a complete list of all projects funded by the UTCRS, please visit:

Railway Mechanical Systems Projects: <http://www.utrgv.edu/railwaysafety/research/mechanical/index.htm>

Railway Infrastructure Systems Projects: <http://www.utrgv.edu/railwaysafety/research/infrastructure/index.htm>

Railway Operation Systems Projects: <http://www.utrgv.edu/railwaysafety/research/operations/index.htm>

UTCRS High School Interns win first place at UTRGV HHMI and third place at UTRGV HIGH Scholars research competitions

On July 29 2016, Esmeralda Infante, one of four High School Interns working with our UTCRS research team, won first place in the Howard Hughes Medical Institute (HHMI) Program research competition. The HHMI program is geared towards advancing biomedical research and science education for the benefit of humanity. Ms. Infante’s research is entitled “Demonstrating and Studying the Emissivity Difference over a Single Bearing and Population of Bearings.” Esmeralda Infante is one of the early UTCRS STEM Summer Camps success stories. Ms. Infante was one of the participants of the Inaugural 2014 UTCRS High School STEM Summer Camp. The camp peaked her interest in science and engineering and she promised back in 2014 to return to the UTCRS and be a part of the research team. In two short years, not only did Esmeralda keep her promise to come back and be a part of the UTCRS research team, but she also impressed the HHMI judges and proudly earned the first place prize. This accomplishment is just the beginning in her very promising and bright future in engineering and the transportation field. Congratulations to Ms. Infante who is currently taking dual-enrollment courses and is set to join us at UTRGV in Fall 2017 where she plans on pursuing a Bachelor’s degree in Mechanical Engineering with a minor in Electrical Engineering.

Three other interns were also part of the UTCRS team in Summer of 2016; namely, Harry Siegel (HHMI Program), Gage Benham (High Scholars Program), and Alejandro Vail (High Scholars Program) who won third place in the High Scholars research competition.

Photo albums of the HHMI and High Scholars Programs Research Competitions are available at the UTCRS website and can be accessed at the following links: [HHMI Competition Album Link](#); [High Scholars Competition Album Link](#).



Alejandro Vail (middle) with his graduate and undergraduate mentors

Gage Benham (middle) with his graduate and undergraduate mentors

HHMI High School Intern Harry Siegel



SUMMER RESEARCH PROGRAMS AND PRODUCTS

2016 RESEARCH EXPERIENCE FOR TEACHERS (RET) JUNE 6 - JULY 11, 2016



The 2016 UTCRS RET Program featured 11 of the most dedicated and brightest teachers from local school districts in the Rio Grande Valley (RGV). These 11 RET participants were selected from 41 highly competitive applications received from teachers that are eager to participate in a research-intensive five-week experience at UTRGV.

For five consecutive weeks, the RET Program participants work closely with UTRGV faculty, students, and staff on STEM education research projects, and development of curriculum tools and modules that introduce K-12 students to STEM concepts using transportation engineering applications with emphasis on railway safety. As part of their professional training, the participants gain hands-on experience by implementing the railway safety curriculum and modules during the UTCRS Summer Camps that draw more than 1000 K-12 students annually. To date, the UTCRS RET Program has engaged 35 different teachers in its various ongoing education and research activities. These teachers have adopted this curriculum and modules and are implementing it in their classes at their school districts.

2016 RESEARCH EXPERIENCE FOR UNDERGRADUATES (REU) May 31 – AUGUST 5, 2016

The 2016 REU Program cohort of fourteen undergraduates successfully completed their ten-week research experience alongside consortium faculty, staff, and students working on research-intensive projects directly related to the UTCRS strategic research goals. Seven students traveled to consortium partner Texas A&M University, and the other seven students traveled to the University of Nebraska-Lincoln. The REU students gained invaluable experience conducting railway safety research pertaining to railway operation and infrastructure systems. Upon returning to their home university, UTRGV, these students continued to work on finalizing and refining their research projects, and presented both a poster and an oral presentation summarizing the main results and conclusions of the performed work during the [Fall 2016 REU Symposium](#). To date, the UTCRS REU Program has engaged 35 students, with 25 of those students positively influenced into pursuing their graduate degrees.



UTCRS K-12 STEM CURRICULUM AND LEARNING MODULES

As part of our commitment to K-12 STEM education and community engagement, the University Transportation Center for Railway Safety (UTCRS) released in summer 2016 the [“UTCRS K-12 STEM Curricula”](#) for Elementary (Grades 3-5), Middle School (Grades 6-8), and High School (Grades 9-12) levels, and the interactive [Railway Safety Learning Module](#). These educational materials have been under continuous development and refinement over the past three years. Faculty, K-12 teachers, staff, and students were all involved in developing this curricula and making it easy to integrate and implement within the class material covered at each school grade level. Over 300 local K-12 teachers had a chance to provide input and feedback during this process. The UTCRS K-12 STEM Curricula are a comprehensive collection of lessons and activities geared towards introducing students to STEM concepts through transportation engineering applications with an emphasis on railway safety. Objectives have been carefully aligned with the National and Texas State educational standards to ensure delivery of learning outcomes across the country. These STEM curricula are dynamic and flexible, and can be used independently or as individual lesson plans incorporated into other STEM curriculum, classrooms activities, homeschool lessons, or STEM afterschool programs. The curricula utilize LEGO® MINDSTORMS® NXT 2.0, LEGO® MINDSTORMS® EV3, and MagLev educational toolkits to deliver, in a challenging yet engaging manner, age-appropriate STEM concepts related to transportation technologies such as programming, engineering design, teamwork, logic, problem solving, and real-life engineering applications. The three levels of curriculum have been successfully implemented during the UTCRS Summer Camps in 2014, 2015, and 2016. The UTCRS curricula have also been widely implemented in numerous classrooms across the RGV school districts.

K-12 STEM EDUCATION AND COMMUNITY ENGAGEMENT

UTCRS K-12 Summer Camps

This past summer, the University Transportation Center for Railway Safety (UTCRS) continued to educate the next generation of transportation engineers inspiring students to pursue careers in science, technology, engineering and mathematics (STEM) through the Railway Safety Summer Camps program. The 2016 UTCRS Summer Camps served close to 1,300 K-12 students, making it the largest transportation summer camp in the nation, and the largest STEM camp ever to be offered at the University of Texas Rio Grande Valley (UTRGV). The camps, which ran from June 6 to July 8, 2016, hosted 585 elementary students, 515 middle school students, and 200 high school students representing over 80 schools from 26 different school districts. The UTCRS STEM Summer Camps continue to attract students from populations traditionally underrepresented in the transportation industry with more than 80% of the camp participants being of Hispanic descent, and more than 40% being female.

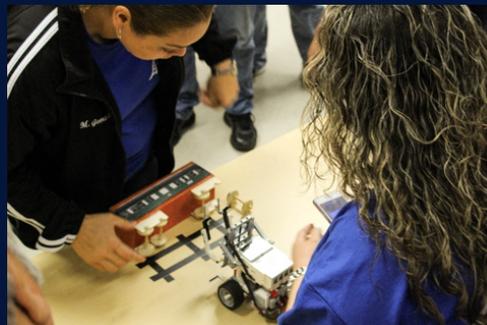
Preparations for the 2017 UTCRS Summer Camps have been underway since December 2016 when the UTCRS held its first planning meeting with more than 25 school district representatives in attendance. The majority of the funding for this year's camps is coming from the different school districts that are participating in these camps who have come to rely on the UTCRS STEM Summer Camps as an extension of their STEM efforts. Currently, the UTCRS Summer Camps are the only STEM camps in the Rio Grande Valley (RGV) that cater to elementary students (Grades 3-5), and these school districts depend on these camps to provide elementary students with an early exposure to STEM concepts using hands-on transportation engineering applications with an emphasis on railway safety.

The 2017 UTCRS STEM Summer Camps are set to host more than 1,000 K-12 students (469 elementary, 395 middle school, and 143 high school) this summer. To date, these camps have served more than 4,000 K-12 students in the Rio Grande Valley since 2014.



K-12 STEM Teacher National Workshop

The UTCRS successfully hosted its second annual “[Transportation in the Classroom: K-12 STEM Teacher National Workshop](#)” June 2-3, 2016 at the campus of the University of Texas Rio Grande Valley (UTRGV). Nearly 100 K-12 STEM teachers, educators, counselors, and program coordinators attended the two-day, four-session, intensive hands-on workshop led by the Research Experience for Teachers (RET) participants from previous years, the UTCRS Director, TAMU Associate Director, and the rest of the UTCRS educational team spearheaded by the Educational Coordinator, Dr. Angela Chapman. The main goals of this workshop were to introduce teachers, educators, school counselors, and program coordinators to the UTCRS developed K-12 STEM curricula, and to train the participants on the use and implementation of this curricula at all grade levels from elementary to high school. The workshop also featured a special session in which the participants were asked to develop their own lesson plans that incorporated the UTCRS STEM Curricula and present to the rest of the group on how they intend to introduce these lesson plans in their own classrooms. Workshop participants were also given the chance to discuss student misconceptions when it comes to STEM concepts, and reflect on ways to address these misconceptions through practical hands-on activities intended to engage students in the learning process.



2016 UTCRS SUMMER CAMPS FINAL COMPETITION AND CLOSING CEREMONY



UTRGV in June 2016 welcomed almost 1,300 students from elementary to high school to its Edinburg Campus for the University Transportation Center for Railway Safety (UTCRS) summer camps, where they built LEGO robots, magnetic levitating trains and bumper cars, all geared to teach them the important roles STEM fields play in creating safe transportation. Monday July 11, 2016 marked the culmination of the 2016 UTCRS Railway Safety Summer Camps with the Final Competitions and Closing Ceremony. During the morning, teams of elementary, middle school, and high school students that were selected finalists during their week of participation faced each other one last time to select the overall camp winning team of each level during the Final Competition. More than 70 students participating in teams faced their final challenges: elementary teams were tasked with creating the most efficient Magnetic Levitation train design for carrying 100 passengers; middle school teams designed and programmed Lego MindStorm® robots to safely transport unknown hazardous material; and high school teams were tasked to design a Lego MindStorm® robot and create a series of pre-programmed tasks to safely transport hazardous waste through carefully placed obstacles, mazes, and minor setbacks based on a real-life scenario.

Later that evening, participating parents and students from K-12 school districts throughout the Rio Grande Valley visited the UTRGV Performing Arts Complex Auditorium to celebrate completion of the five-week summer camps and to find out who had won the final competition earlier in the day. They also heard encouraging words from then U.S. Congressman Rubén Hinojosa (TX-15) to continue pursuing STEM-related careers. He and the UTRGV officials praised the parents for being there for their children.

“Parental support is the key to the success,” Hinojosa said.

During the ceremony, the audience celebrated the achievements and the completion of the program for the students who attended the camps, and applauded the elementary, middle school, and high school Final Competition team winners. Parents had the opportunity to see their children in action at the Summer Camps through a video presentation. UTCRS Director, Dr. Constantine Tarawneh, also took the opportunity to thank and address the parents in attendance urging them to continue encouraging their children to pursue an education and careers in STEM fields, and to find ways to provide early guidance and preparation in the pursue of STEM careers.

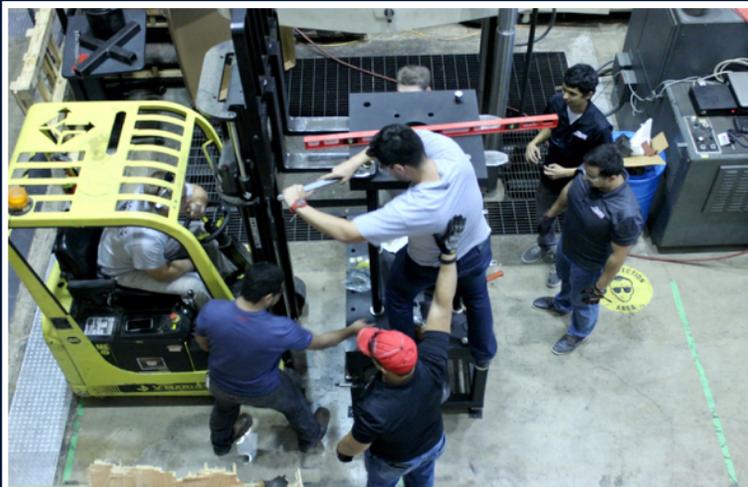
The Railway Safety Summer Camps have become a point of pride for everyone involved including the UT System, Hispanic Associate of Colleges and Universities (HACU), the office of former U.S. Congressman Rubén Hinojosa (TX-15), and the UTRGV, who participated in the Closing Ceremony and broadcasted this great event at a national social media level.

TECHNOLOGY TRANSFER

Since the first half of 2016, the UTCRS research group composed of faculty and students designed and fabricated an efficient and compact Four Bearing Tester that can be used to perform long-duration service life tests to characterize bearing performance and assess the quality of the bearing steel. This four bearing tester is housed in a specially designed environmental chamber that can mimic ambient conditions as low as -40°F and as high as 150°F . This new dynamic test rig can be used to carry out laboratory experiments for any railroad bearing class used in both the United States and Canada. It is capable of simultaneously testing four bearings mounted on a test axle, and can apply up to 50 kips of vertical load per bearing while running at train speeds up to 85 mph. The new tester design is meant to be a more compact, safer, and overall more efficient design from other dynamic test rigs currently in use in the industry.

The UTCRS research group plans to utilize this new test rig to further develop and refine their prototype onboard bearing condition monitoring system that utilizes temperature, vibration, and load sensors. The onboard condition monitoring system is used in combination with an algorithm that is designed to effectively and reliably identify any defects that may occur within a railroad bearing, and track the growth and deterioration of these defects with mileage and time. The main objective of the onboard bearing condition monitoring system, coupled with the developed algorithm and the defect propagation model, is to minimize disruption in railroad operations once a defect is identified, and safely schedule maintenance protocols without compromising the safety and efficiency of the railroad industry. The addition of this tester to the UTCRS infrastructure provides enhanced research capabilities that can accelerate projects of interest to the rail industry.

Moreover, the UTCRS research group has also developed two models that predict the Oxidation Induction Time (OIT) of railroad bearing grease, which measures the remaining life of the lubricant. These models are readily accessible and are available for anyone to use through the UTCRS website at: <http://quality.engr.utrgv.edu:8080/RailwayGreaseOIT-Predictor/>





FOR MORE INFORMATION

All content contained in this newsletter and any attachments is original material of UTCRS. Changes, dissemination, copy or use of the material included in this document must be approved by the UTCRS.

For more information regarding the contents of this newsletter, please contact: Dr. Constantine Tarawneh, UTCRS Director, at constantine.tarawneh@utrgv.edu

CONTACT US

Visit our website
railwaysafey.utrgv.edu

Email us at
railwaysafety@utrgv.edu

Call us at
(956) 665-8878