



CENTER FOR RESEARCH & EDUCATION IN  
ADVANCED TRANSPORTATION ENGINEERING SYSTEMS

# Rowan University Construction Materials and Pavement Research

**Ayman Ali, Ph.D.**

Manager, Center for Research and  
Education in Advanced Transportation  
Engineering Systems (CREATEs)

109 Gilbreth Pkwy,  
Mullica Hill, NJ 08062

[www.rowan.edu/creates](http://www.rowan.edu/creates)

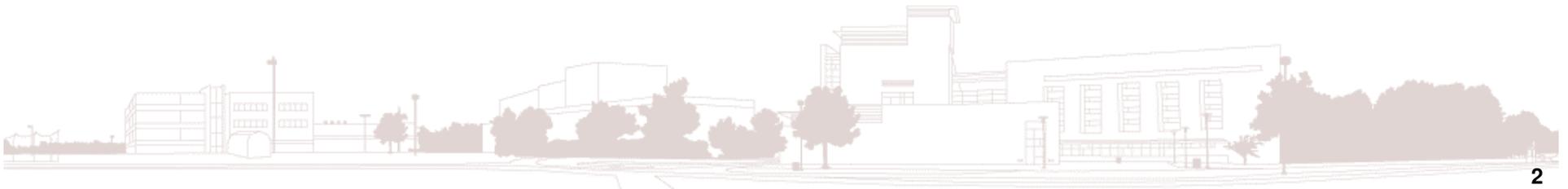


The 51st Annual Mid-Atlantic Quality Assurance Workshop in Dover, DE

# In this presentation...

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- Mission and Impact
- Research Activities
- Educational Programs
- Workforce Development Programs





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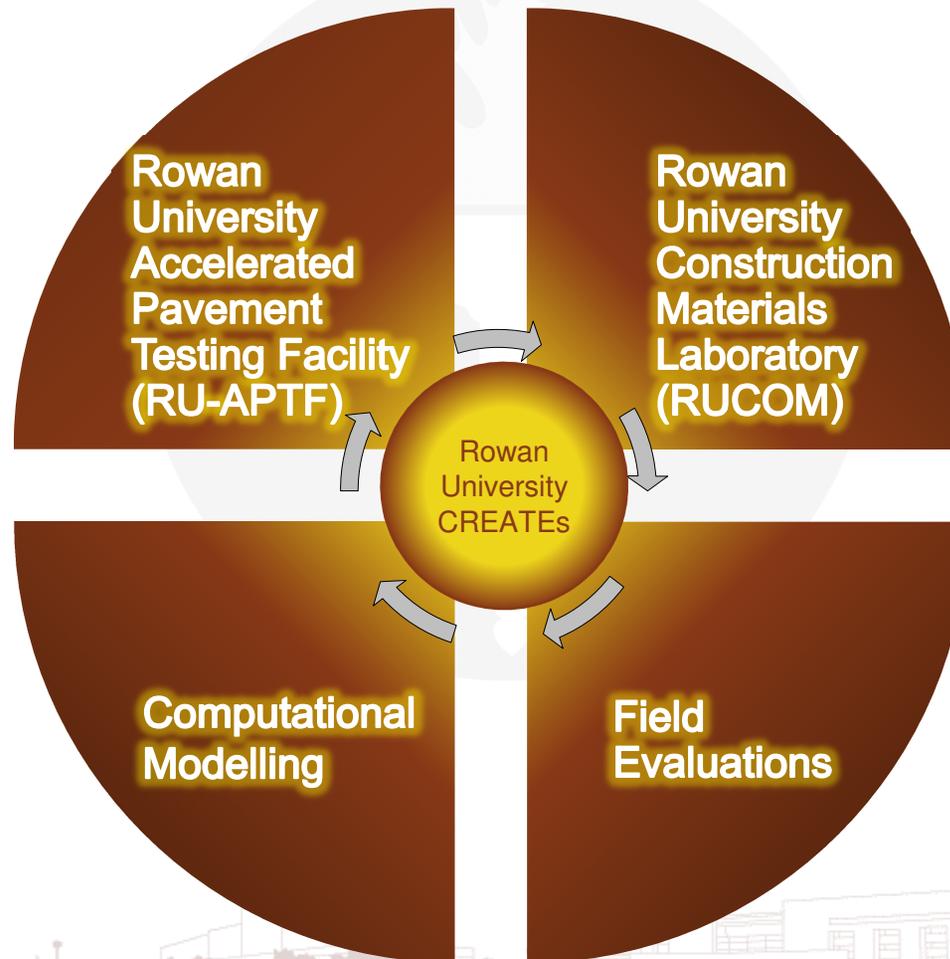
# CREATEs' Mission and Impact



The 51st Annual Mid-Atlantic Quality Assurance Workshop in Dover, DE

# Rowan CREATEs

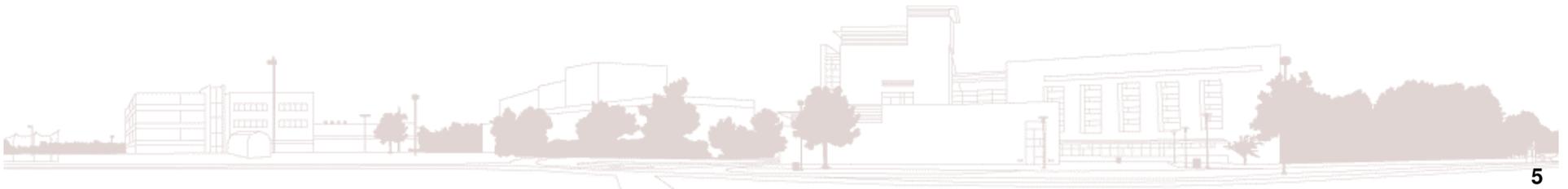
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# CREATEs Mission

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- ❑ To conduct cutting edge, applied, and readily implementable research in transportation engineering.
- ❑ Create a diverse work environment that educates and trains the next generation of professionals.



# CREATEs Impact



# CREATEs HVS

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- ❑ Rowan University received the HVS (Mark IV model) as a loan from the United States Army Corps of Engineers (USACE).
- ❑ Typically used to evaluate flexible (asphalt) and rigid (cement) pavements.
- ❑ Apply uni- and bi-directional loading along with advanced temperature control ([heating and cooling systems](#)).



# CREATEs HVS

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# CREATEs HVS (Heating Unit)

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# CREATEs HVS (Cooling Unit)

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# CREATEs Research Team

**Yusuf Mehta and Ayman Ali overall management of the facility. Serve as PI of projects**

- Constr. Materials lab
  - Full time: Post-doc
  - Full time: Lab technician
- Accel. Pavement Testing Facility:
  - Full time: CREATEs tech (mainly HVS)
  - Full time: One Post-doc. One more expected to join in summer 2018

**Two doctoral students and one MS, and twenty undergraduate students**



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# CREATEs' Research Activities



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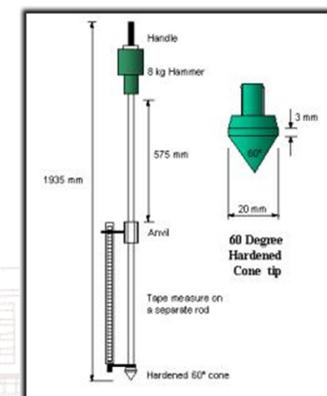
# Recently Completed Research Projects



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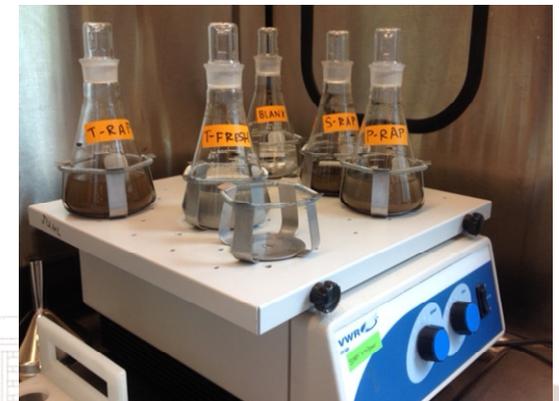
# Alternatives to Nuclear Density Testing

- ❑ **Objective:** Replacing the NDG with non-nuclear alternative method(s) during the compaction of soils and dense graded aggregates.
- ❑ Briaud compaction device (BCD), light weight falling deflectometer (LWD), and dynamic cone penetrometer (DCP).
- ❑ A procedure for compacting large soil samples in the lab was also developed as part of this study.



# Environmental Impacts of RAP

- ❑ **Objective:** Investigate the environmental impacts of unbound reclaimed asphalt pavement (RAP) while it is freshly processed and after subjecting it to an accelerated weathering process.
- ❑ Weather RAP in an environmental chamber at Columbia University
- ❑ Screen leachate from RAP using two toxicity testing assays:
  - ❑ Microtox® assay
  - ❑ Japanese Medaka fish early life stage larval assay



# Optimization of Semi-Circular Bend

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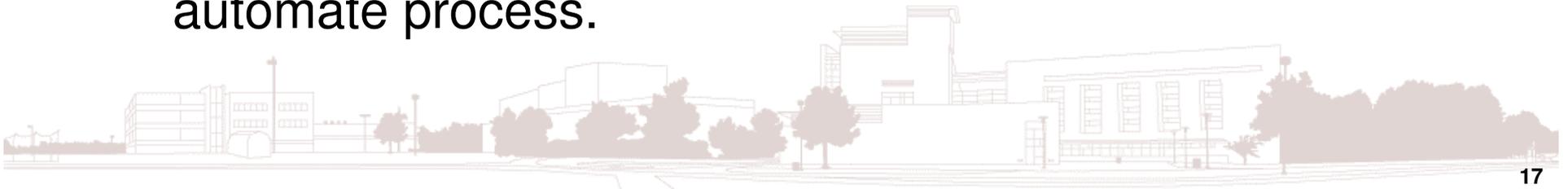
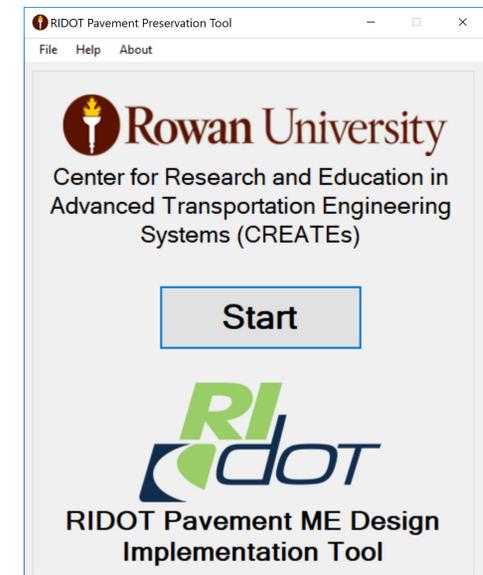
- ❑ **Objective:** Determine the optimal testing parameters for conducting the SCB test on New Jersey specialty mixes (HPTO, SMA, & BRIC).
- ❑ **Approach:** conduct SCB on samples prepared from NJDOT specialty mixes while varying testing temperatures, notch depths, and loading rates.
- ❑ Statistical analysis will be conducted to determine the most repeatable and most reliable combination of SCB testing parameters.



# Identify Appropriate Pavement Preservation Strategies for RIDOT

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- ❑ **Objective:** To develop optimal timing for different pavement preservation strategies utilizing last six years of pavement performance data and PAVE ME data (using RI traffic distribution).
- ❑ Several strategies considered: Crack Seal, SAMI, PPEST, etc.
- ❑ A software was developed to automate process.





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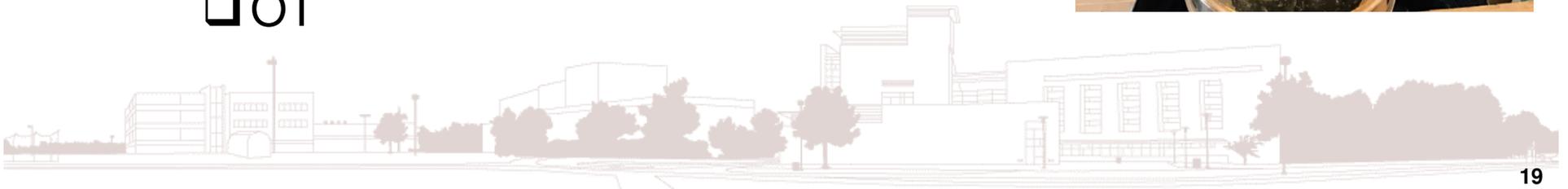
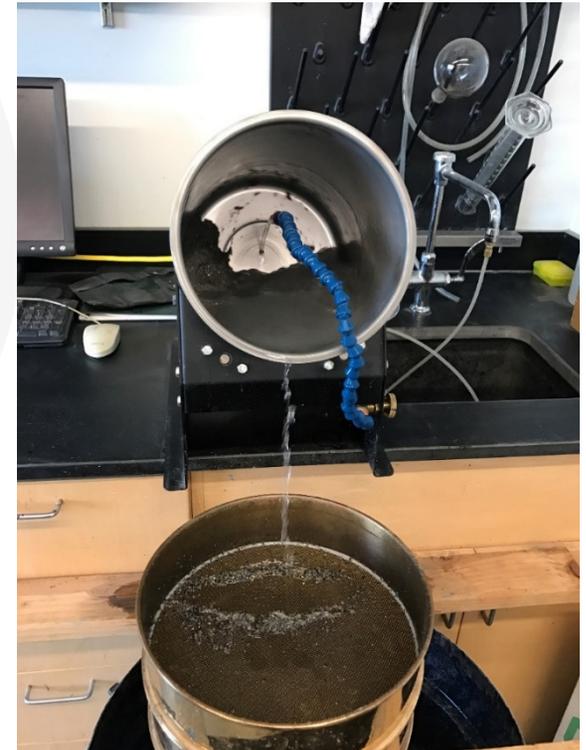
# Recently Active Research Projects



# Evaluation of Incinerated Waste Aggregates

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- Objective:** Evaluate the performance of hot mix asphalt (HMA) incorporating aggregates obtained from incinerated waste.
- Conduct mix design according to Superpave procedures.
- Evaluate volumetrics and performance:
  - Bulk and Rice Specific Gravities
  - APA
  - OT



# HMA Characterization using the Simple Visco-Elastic Damage Model (VECD)

- ❑ **Objective:** Evaluate the effect of specimen geometry on fatigue predictions using PP-VECD approach in smaller-medium NMAS and binder rich mixtures.
- ❑ Four mixtures:
  - ❑ 9.5ME, 12.5 SMA, HPTO, and BRIC.
- ❑ Laboratory Testing:
  - ❑ **AASHTO TP 79 & TP 107**



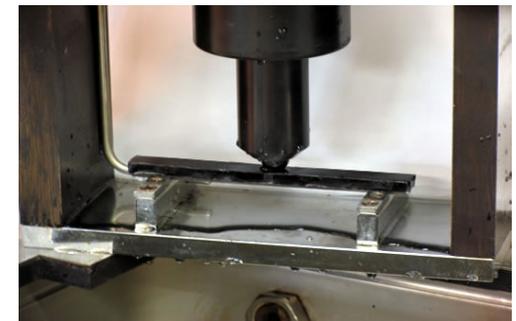
# Rejuvenator Mixing Procedure in High Reclaimed Asphalt Pavement (HRAP)

❑ **Objective:** Determine the impact of mixing procedure of rejuvenator oil dosage for HRAP (50%) mixtures using mechanistic characteristics of Low RAP binder mixtures.

❑ **Laboratory Testing:**

❑ **Rheological Properties:** DSR, BBR, MSCR

❑ **Mixture Testing:** APA and OT



# Fuel Resistant Asphalt Binders

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**Objective:** Develop fuel resistant asphalt binders using bio-polymers.

**Potential Applications:**

- Airport hangars and taxiways
- Parking pavements
- Drive-ways; and Gas stations

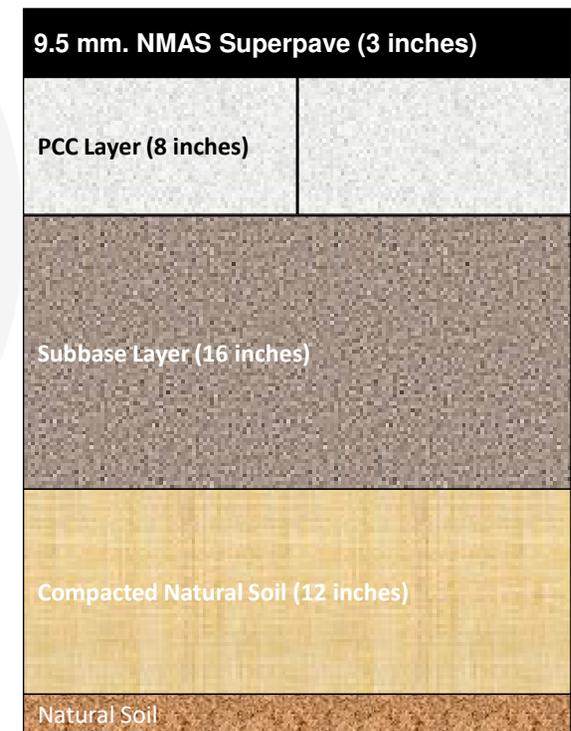
**Laboratory Testing:**

- Rheological Properties:** DSR, BBR, MSCR
- Mixture Testing:** APA and OT



# HVS Evaluation of Thin Asphalt Overlays

- ❑ **Objective:** Estimate the life expectancy of thin asphalt overlays using full-scale accelerated pavement testing.
- ❑ **Approach:** Conduct comprehensive laboratory testing on a total of four mixes (One control and three specialty NJDOT mixes). Construction full-scale sections and conduct testing using a Heavy Vehicle Simulator (HVS).



# Evaluation of Geogrid Reinforced Flexible Pavements

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## □ Objective:

- Comprehensive laboratory evaluation of the potential benefits for using Geogrids as a stabilizing element in airfield pavements.
- Numerical modeling (FEM) of geogrid-reinforced airfield pavement.

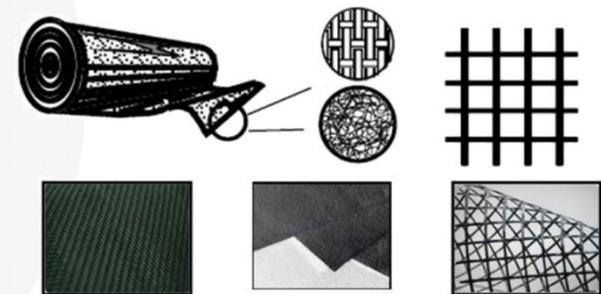


Image courtesy of Bathurst, 2007

- **Approach:** Compare laboratory performance at low to high temperatures for five different types of Geogrid reinforced HMA



# Cold In Place Recycling for Heavy Traffic

❑ **Objective:** Comprehensive laboratory and full-scale testing of Cold In-Place Recycling (CIPR) technologies implemented by Department of Defense .

❑ **Approach:** Develop a balanced mix design and conduct several full-scale testing on Cold In-Place Recycled mixes to validate laboratory performance.

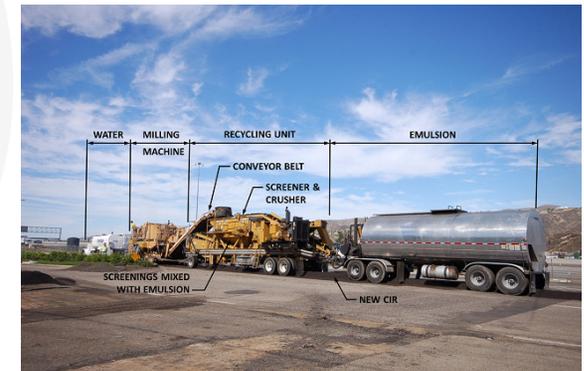


Image courtesy of dpw.lacounty.gov



# Full-Scale Testing of Rapid Precast and CIP Repair Technologies

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- ❑ **Objective:** Full-scale evaluation of precast and Cast In-Place (CIP) concrete pavement rapid repair technologies. Recommending a list of systems for inclusion in NJDOT's Approved Materials List.
- ❑ **Approach:** Conduct comprehensive laboratory and full-scale testing on a variety of precast and cast in-place rapid Portland cement concrete (PCC) pavements.
- ❑ **Status:** Project awarded/Under contract

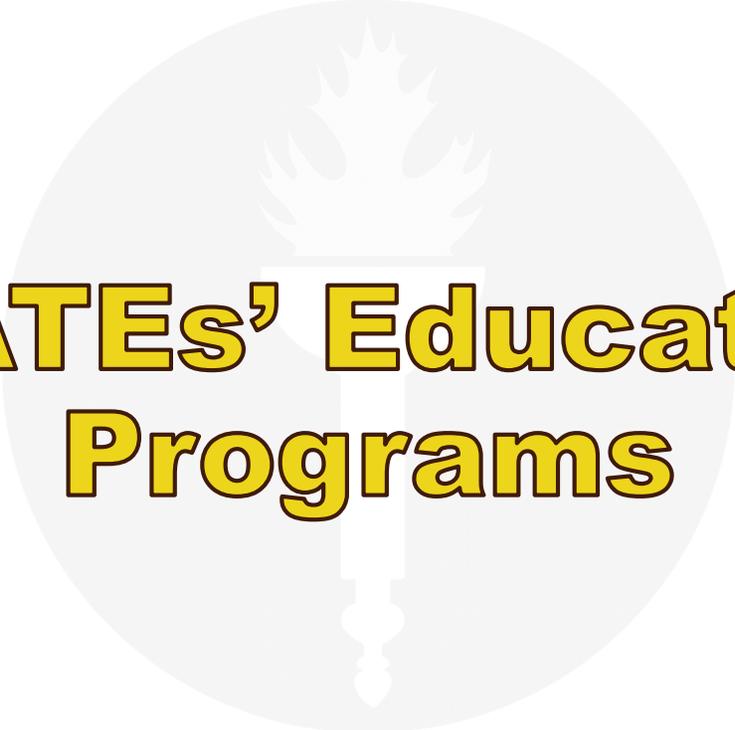


Image courtesy of FHWA



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# **CREATEs' Educational Programs**



The 51st Annual Mid-Atlantic Quality Assurance Workshop in Dover, DE

# National Summer Transportation Institute

- ❑ Fifteen High school students
- ❑ Four weeks at CREATEs/Rowan (07/24-8/19, 2017)
- ❑ One week each on Air, Land, Maritime and Safety
- ❑ Hands-on experiments, talks from leaders, site visits to several places, such as PANYNJ, asphalt plant, FAA Tech Center, ACE Academy

**For more information:**  
[www.rowan.edu/creates](http://www.rowan.edu/creates)

# CREATEs' Fellowship Program

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- ❑ Goal is to provide hands-on experience to undergraduate students (freshman to seniors) in laboratory and the accelerated testing facility.
- ❑ We have 20+ fellows in the last three years.
- ❑ Supervised by Faculty, research associates and lab managers.
- ❑ Broad range of experience.
- ❑ They get a first preference for interview from sponsor.



# CREATEs' Fellowship Program



Steve Buzby



Gabriel  
Wickizer



Samuel  
Feldman



Darren  
Weiss



Zachariah  
Wenig



Ryan Kruger



Marissa  
Ciocco



Dylan  
Livingston

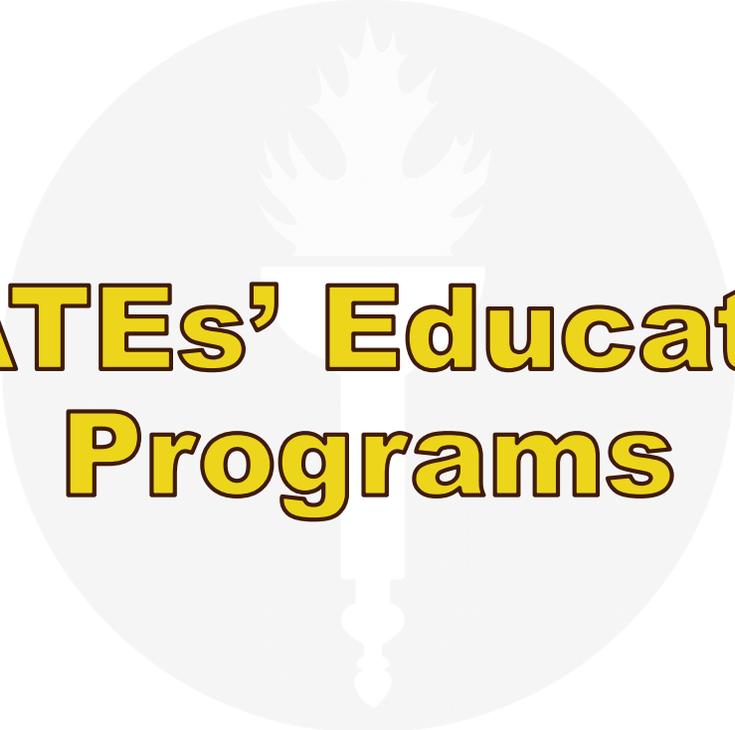


DVEWC  
Awards



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# CREATEs' Educational Programs



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# **CREATEs Soils and Aggregates Technician Certification Program**

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- ❑ To train technicians on how to conduct laboratory and field testing of soils and aggregates necessary for acceptance and quality assurance.
- ❑ CREATEs held its first program in January 2018.
- ❑ A total of 13 technicians and engineers participated.
- ❑ Next round: October/November 2018.



# CREATEs Pavement Design and Rehabilitation Workshop

- ❑ To provide the necessary training on how to use the latest pavement design and rehabilitation tools.
- ❑ Anticipated Date: TBD
- ❑ Similar to Soil and Aggregates Certification program, this program will be ***free of charge*** for federal, state, and local government employees.



# Thank you from the CREATEs team

Ayman Ali, Ph.D.

Manager, Center for Research and Education in  
Advanced Transportation Engineering Systems  
(CREATEs)

109 Gilbreth Pkwy,  
Mullica Hill, NJ 08062

E-mail: [creates@rowan.edu](mailto:creates@rowan.edu)

[www.rowan.edu/creates](http://www.rowan.edu/creates)

