Civil & Environmental Engineering
Florida International University

FIU Engineering Center
10555 West Flagler Street
Miami, FL 33174
305-348-2802
About FIU
Florida International University

• Located in Miami, Florida
  • Miami’s first and only public research institution
  • Diverse population
  • Tropical climate

• Two major campuses
  • Modesto A. Maidique Campus (MMC) in West Miami-Dade
  • Biscayne Bay Campus in North Miami Beach

• Five additional locations
  • Engineering Center near MMC
  • Broward Pines Center; Downtown Brickell Business Center; Miami Beach Urban Studios; Wolfsonian FIU on South Beach
About the College of Engineering & Computing (CEC)
Florida International University

- Housed in Engineering Center (EC)
  - 250,000-sqft. building on 38 acres
  - Two miles from main FIU campus
  - 6 Departments, including CEE
- WorldsAhead faculty
  - American Society for Engineering Education (ASEE) found FIU CEC to have most productive faculty in Florida and ninth most productive faculty in the U.S.
- Commitment to student success
- First-class research centers and teaching laboratories; access to cutting-edge technology
About the Department of Civil & Environmental Engineering (CEE)

Florida International University

- **Five degrees offered**
  - BS in Civil or BS in Environmental
  - MS in Civil or MS in Environmental
  - PhD in Civil
- **Five specialty areas in Civil Engineering**
  - Structural, Geotechnical, Construction, Transportation and Water Resources Engineering
- **28 full-time faculty members**
- **1,010 students enrolled**
  - 832 undergraduate, 107 Masters, 71 Doctoral
- **State-of-the-art research centers & facilities**
  - Lehman Center for Transportation Research (LCTR)
  - Center for Accelerated Bridge Construction
  - Titan America Structures Testing Laboratory
  - Wall of Wind

*Faculty in the Driving Simulation Lab of the LCTR*
CEE Student Organizations at FIU

- American Society of Civil Engineers (ASCE)
  FIU and UM are hosts of the 2013 ASCE Southeast Region ASCE Student Conference

- ACI Student Chapter at FIU

- Chi Epsilon National Civil Engineering Honor Society

- Institute of Transportation Engineers (ITE)
  10-time Winner of ITE ‘Best Student Chapter’ Award

- Tau Chi Alpha National Environmental Engineering Honorary

- Water Environment Federation (WEF)
Transportation Engineering Faculty

• Fabian Cevallos, Ph.D.
  Transit Program Director

• Albert Gan, Ph.D.
  Professor

• Mohammed Hadi, Ph.D., P.E.
  Associate Professor
Transportation Engineering Faculty

• Xia Jin, Ph.D., A.I.C.P.
  Assistant Professor

• Sylvan Jolibois, Ph.D.
  Associate Professor

• L. David Shen, Ph.D., P.E.
  Professor &
  Graduate Program Director
Transportation Engineering
Research Associates and Staff

- Dr. Yan Xiao
- Dr. Halit Ozen
- Dr. Tao Wang
- Dr. Priyanka Alluri
- Dr. Feng Gui

- Dr. Kirolos Haleem
- Dr. Kaiyu Liu
- Ms. Meng Ma
- Mr. Haifeng Wang
- Dr. Wanyang Wu
Transportation Engineering
Ph.D. Students

1- Jinyan Lu - Safety Performance Functions
2- Li Tang - Automatic Extraction from Aerial Images
3- Dibakar Saha - Improved Processes for Safety Manual
4- Ayman Elbermavy - Bay Overflow Impact at Intersections
5- Shaghayegh Shabanian - Dynamic Traffic Assignment
6- Ali Darroudi - Connected Vehicle Technologies Impacts
7- Xuanwu Chen - Railroad Crossing Signal Preemption
8- Hamidreza Asgari - Activity-Travel Patterns
9- Md Sakoat Hossan - Ancillary Transportation Demands

FIU
Civil and Environmental Engineering
Florida International University
Transportation Engineering
Faculty Research Interests

Fabian Cevallos, Ph.D.
Advanced public transportation systems (APTS), transit planning and operations, business intelligence, traffic safety, information technology

Albert Gan, Ph.D.
Public transit, traffic simulation and control, ITS, highway safety, access management, information technology

Mohammed Hadi, Ph.D., P.E.
ITS, connected vehicles, traffic control systems, freeway operations, simulation/DTA, traffic safety
Transportation Engineering
Faculty Research Interests

Xia Jin, Ph.D., A.I.C.P.
Transportation planning, travel demand modeling, surveys, GIS and database management

L. David Shen, Ph.D., P.E.
Airport design and planning, public transportation, intermodal facilities
Centers Associated with Transportation Engineering at FIU

LCTR – Lehman Center for Transportation Research
Transportation Engineering Sponsor Organizations

USDOT University Transportation Centers
US Department of Transportation
Florida Department of Transportation
Florida Turnpike
Miami-Dade Expressway Authority
Miami-Dade Transit
Miami-Dade Metropolitan Planning Organization
Transportation Laboratories and Testing Facilities
Integrated Intelligent Transportation Systems Laboratory (IITS)
The Driving Simulator: STISIM Drive Model 400 with Car Conversion Kit
Next Few Slides Show Sample Projects in Transportation Engineering
Intelligent Transportation Research

- Testing and assessment of new ITS Technologies
- ITS evaluation and benefits-cost of ITS
- Data capture, mining, and performance assessment
- Off-line and real-time decision support systems for traffic management
- Macroscopic, microscopic, and mesoscopic simulation
- Dynamic traffic assignment
- Managed lane simulation
Integrated ITS Lab

- One of the most advanced in the nation
- Share video and data with traffic management centers
- Develop and test off-line and real-time tools and methods
ATSIM 4.0

- Designed to keep track of transit stop facilities and their amenities. It automates the data collection and analysis process. It avoids time-consuming manual data entry and duplication of records and facilitates data management.
Florida APTS Program

- Develops strategies, promotes knowledge sharing, and supports the implementation of transit Intelligent Transportation Systems (ITS). The program is a key component in the Florida Department of Transportation efforts to provide transit agencies with ITS technical assistance and technology transfer.

<table>
<thead>
<tr>
<th>(APC)</th>
<th>(EFC)</th>
<th>(Stops)</th>
<th>(Census)</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Time], [Date], [Bus], [Ons], [Offs], [Latitude], [Longitude]</td>
<td>[TimeStamp], [Date], [Bus], [Route], [Senior/Disabled/Children]</td>
<td>[ID], [Stop Name], [Latitude], [Longitude]</td>
<td>[Income], [CarOwnership], [Age], [Area]</td>
</tr>
</tbody>
</table>

GIS Application (ArcGIS)

Data Mining

- Prioritize Stop and Amenity Locations
- Identity Routes with special distributions
- Analyze ridership
Travel Demand Forecasting and Behavior Analysis

Daily Travel Activities

- Home
- Coffee Stop
- Work
- Lunch
- Stop at Store

Demand Modeling Framework

- Home/Work/school location
- Compressed/chain pattern
- Transit pass/transponder
- Auto ownership
- Daily Activity Pattern (tour generation)
- Tour primary destination
- Tour time of day choice
- Tour mode choice
- Trip mode choice
- Assignment (route choice)

Where – destination  How – mode
When – time of day  What – route
Transportation Infrastructure and Urban Form Development

Mode Share by Land Use Pattern

Land Use Accessibility by Transit Modes
Structural Engineering Faculty

- Atorod Azizinamini, Ph.D., P.E.
  Professor & Chair

- Amir Mirmiran, Ph.D., P.E.
  Professor & Dean

- Ton-Lo Wang, Ph.D., P.E.
  Professor & Assoc. Chair

- Caesar Abi Shdid, Ph.D., P.E.
  Director of External Programs
Structural Engineering Faculty

- Ralf W. Arndt, Dr. –Ing.
- Arindam Gan Chowdhury, Ph.D.
- Peter A. Irwin, Ph.D., P.Eng.
- Kingsley Lau, Ph.D.
- Nakin Suksawang, Ph.D.
- Ioannis Zisis, Ph.D.
Structural/Geotechnical Engineering Faculty

• Hesham Ali, Ph.D., P.E.
  Green Paving Professor of Practice

• Michael Bienvenu, Ph.D., P.E.
  Karl Watson, Jr. Professor of Practice in Concrete Pavement Sustainability
Structural Engineering
Research Associates and technical Staff

Dr. Aaron Yakel
Dr. Pedram Zohrevand
Mr. Edgar Polo
Walter Conklin – Lab Manager
Jimmy Erwin – Research Scientist
Roy Liu – Research Scientist
Structural Engineering Ph.D. Students

1- Jawad Gull - Steel bridges
2- Alireza Mohammadi - Steel bridges
3- Brian Chun - Steel bridges
4- Xiong Yang - Segmental Bridge
5- Sahar Ghasemi - Movable Bridge
6- Md. Ahsan Sabbir - Infrastructure Coating Durability
7- Maryam Asghari Mooneghi - Wind Engineering
8- Mojtaba Afzali - Pavement Recycling
9- Shuo Zhang - Concrete Durability
10- Daniel Yohannes - Fiber Reinforced Concrete
Structural Engineering
Ph.D. Students

11- Brandon Mintz - Innovative Roofing Systems
12- Arash Tarighi - Bridge Vibration
13- Tuan-Chun Fu - Large-Scale Aerodynamic Testing Approaches for Low-Rise Buildings
14- Thomas Baheru - Wind-Driven Rain Intrusion in Buildings
15- Debbie Meyer - Wind Induced Effects on 3-D Variable Message Sign
16- Ramtin Kargarmoakhar - Vortex Induced Loading on Lang Span Bridges
Structural Engineering Ph.D. Students

17- Filmon Habte - Wind-Induced Internal Pressures in Buildings
18- Workamaw Warsido - Computational Wind Engineering
19- Edgar Polo - Concrete Pavement
Caesar Abi Shdid, Ph.D., P.E.
sensing technologies in construction, use of artificial intelligence algorithms to predict thermal lifecycle costs of buildings

Ralf W. Arndt, Dr. –Ing.
developing and adapting non-destructive testing (NDT) technologies for inspection of aging infrastructure

Atorod Azizinamini, Ph.D., P.E.
high performance steel, accelerated bridge construction, seismic resistance
Structural Engineering
Faculty Research Interests

Arindam Gan Chowdhury, Ph.D.
wind engineering, effects of hurricane winds on buildings and structures

Peter A. Irwin, Ph.D., P.Eng.
local wind pressures on building wall cladding and roofing elements

Kingsley Lau, Ph.D.
corrosion of engineering materials, durability of reinforced concrete and prestressed concrete, infrastructure materials durability
Amir Mirmiran, Ph.D., P.E.
fiber reinforced plastic (FRP) composites for infrastructure, bridge engineering, non-destructive testing of concrete and composites, ultra high performance concrete (UHPC) and post-tensioned segmental bridge

Nakin Suksawang, Ph.D.
structural health monitoring and field testing, bridge engineering, structural reliability, materials
Structural Engineering
Faculty Research Interests

Ton-Lo Wang, Ph.D., P.E.

railway and highway bridge vibration, impact, reliability, load distribution, fatigue damage analyses

Ioannis Zisis, Ph.D.

structural and environmental wind engineering
Structural/Geotechnical Engineering
Faculty Research Interests

Hesham Ali, Ph.D., P.E.
research and development of green paving methods, including pavement recycling and innovative paving materials; pavement design, analysis and construction

Michael Bienvenu, Ph.D., P.E.
design and analysis of ultra-high performance concrete overlays for pavements; impacts of concrete pavement construction on state and local Florida economies; safety and social sustainability of concrete pavements
Centers Associated with Structural Engineering at FIU

IHRC Wall of Wind
Center for Accelerated Bridge Construction
Structural Engineering Sponsor Organizations

National Science Foundation
Florida Department of Transportation
Strategic Highway Research Program (SHRP2)
National Steel Bridge Alliance
National Cooperative Highway Research Program
Florida Department of Emergency Management
Florida Sea Grant
National Park Service
HIP Paving
Private Industries
Structural Laboratories and Testing Facilities
Wind Engineering and
Wall of Wind
Titan America Structures and Construction Testing Laboratory
Green Paving Laboratory
Next Few Slides Show Sample Projects in Structural Engineering
Accelerated Bridge Construction
Service Life of Bridges

1. Identify the job and service life requirements.

2. Identify feasible bridge system alternatives that satisfy design provisions of LRFD Specifications.

3. Evaluate all components, elements, and subsystems of the selected bridge system alternatives against service life requirements in the guide stated in various guide chapters.

4a. Does specific service life apply?
   - Yes
   - No

4b. Identify mitigation procedure and incorporate changes to bridge configurations.

4c. Are all service life requirements considered?
   - Yes
   - No

   Go to A

Bridge Deterioration

- Condition
- Service Life
- Time of Use
- Condition
- Time of Use

Design Guide for Bridges for Service Life

FIU Civil and Environmental Engineering
Florida International University
Wind Engineering

Wind load paths on wood buildings

Codification of wind-induced loads on structural and non-structural building attachments

12-Fan WOW is the nation’s only university research facility capable of simulating a Category 5 hurricane with wind-driven rain
Impact on Florida Building Code

- Recommendations made as a result of testing at the 6-Fan Wall of Wind (WOW) were published in the 2010 Florida Building Code (FBC).

- The new code provisions are geared toward decreasing the vulnerability of roofs.

- This research-to-application endeavor, at such a rapid pace, underscores the importance of FIU’s WOW.
Future Wall of Wind Testing

Tall Building Studies
Realistic building shape optimization and high Reynolds number tests

Wind Loading During Bridge Construction

Wind effects on Traffic Infrastructure and Utilities

Wind-Bridge-Vehicle Interaction Studies

FIU
Civil and Environmental Engineering
Florida International University
Advanced Materials
Segmental Bridges with CFCC Strands
Movable Bridges with UHPC
Corrosion and Infrastructure Materials

Durability

Photos courtesy of FDOT

Photo courtesy of Parsons Brinckerhoff

Photo courtesy of K.Lau
Non-Destructive Testing and Infrastructure Diagnostics

Photo courtesy of FDOT

Magnetic Flux Leakage Signal

Signal/Volt

Distance / in

Defect
Steel Bridge Research
Environmental & Water Resources Engineering Faculty

- Omar Abdul-Aziz, Ph.D.
  Assistant Professor

- Anna Bernardo-Bricker, Ph.D.
  Instructor

- Hector R. Fuentes, Ph.D., P.E.
  Professor

- Shonali Laha, Ph.D., P.E.
  Associate Professor
Environmental & Water Resources Engineering Faculty

- Cora Martinez, Ph.D.
  Instructor & Undergrad. Advisor

- Walter Z. Tang, Ph.D., P.E.
  Associate Professor

- Berrin Tansel, Ph.D., P.E.
  Professor
Environmental & Water Resources Engineering Research Associates

Dr. Shrawan Singh
Environmental & Water Resources Engineering
Ph.D. Students

1- Sharon Surita - Waste Decomposition and Fate
2- Bahareh Inanloo - Linear Infrastructure Systems
3- Manuel Moncholi - Sustainable Sludge Composting
4- Claudia Cardona - Kinetic Modeling of Fenton Treatment
5- Khandker Ishtiaq - Eco-environmental Robust Modeling
6- Nantaporn Noosai - Mercury Geochemical Modeling
7- Luis G. Perez - Satellite-Vadose Zone Coupled Modeling
8- Yonas Habtemichael - Aquifer Augmentation
9- Carlos Tamayo - Coastal Sustainable Adaptation
Environmental & Water Resources Engineering
Faculty Research Interests

Omar Abdul-Aziz, Ph.D.
Ecological engineering, urban surface water quality dynamics, climate change, wetland and forest GHG emissions

Anna Bernardo-Bricker, Ph.D.
Method development and quality assurance of air quality monitoring data, molecular characterization of aerosol particles, indoor air quality

Hector R. Fuentes, Ph.D., P.E.
Water resources engineering, sustainable and green engineering solutions, experimental and modeling development
Shonali Laha, Ph.D., P.E.
Physicochemical and microbial processes, fate of contaminants, hazardous waste treatment technologies

Walter Z. Tang, Ph.D., P.E.
Physicochemical treatment, advanced oxidation processes, quantitative structure and activity relationships, health risk assessment

Berrin Tansel, Ph.D., P.E.
Hazardous and industrial waste management, landfill processes and release mechanisms, sustainable sludge treatment and recovery
Centers Associated with Environmental & Water Resources Engineering at FIU

ARC – Applied Research Center
Environmental & Water Resources Engineering
Sponsor Organizations

NASA
NSF
US Department of Energy
Hinckley Center for Solid & Hazardous Waste Management
University Transportation Center, University of Florida
Environmental & Water Resources Laboratories and Testing Facilities
Environmental Engineering Laboratory
Next Few Slides Show Sample Projects in Environmental & Water Resources Engineering
Linking Remote Sensing Measurements to Vadose Zone Modeling at Everglades National Park

The Concept

The Experiments

The Approach
Assessment of the Effectiveness of Removal of Nutrients and Emerging Pollutants by the Miami-Dade County BBCWR Pilot Plant
Stormwater Research on Miami River Basin, FL
Transport Characteristics of Emulsified PHC Based Oils before and after Dispersant Application

Structural formulas representing three of the possible siloxane compounds (McGraw Hill, 2012)

Deposits formed in landfill gas engines: a. spark plugs, b. engine head, c. intercooler radiator (Sevimoglu and Tansel, 2012).

Surface treated with silcone based polymers: a. exterior tiles, b and c. exterior metal surfaces, d. exterior bricks, e. plaster, concrete and marble surfaces.

<table>
<thead>
<tr>
<th>Compound</th>
<th>Concentration in LFG (mg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decamethyltetrasiloxane (L4)</td>
<td>&lt; 0.5</td>
</tr>
<tr>
<td>Decamethylcyclopentasiloxane (D5)</td>
<td>2.9 ± 0.1</td>
</tr>
<tr>
<td>Dodecamethylcyclohexasiloxane (D6)</td>
<td>&lt; 1.0</td>
</tr>
<tr>
<td>Hexamethyl disiloxane</td>
<td>1.6 ± 0.1</td>
</tr>
<tr>
<td>Hexamethyl-(cyclo)-trisiloxane (D3)</td>
<td>&lt; 1.0</td>
</tr>
<tr>
<td>Octamethylcycloptetrasiloxane (D4)</td>
<td>5.0 ± 0.2</td>
</tr>
<tr>
<td>Octamethyl-trisiloxane (L3)</td>
<td>&lt; 0.5</td>
</tr>
<tr>
<td>Total Siloxanes</td>
<td>9.5 ± 0.4</td>
</tr>
</tbody>
</table>
Advanced Oxidation Processes

Fundamental theory on AOPs

$\text{H}_2\text{O}_2/\text{UV}$, $\text{H}_2\text{O}_2/\text{Ultrasound}$, $\text{TiO}_2/\text{UV}$, Fenton process, high energy electron irradiation, $\text{H}_2\text{O}_2/\text{O}_3/\text{UV}$

200 QSAR Models

Kinetics and Mechanisms

$E_{\text{LUMO}}$ and $E_{\text{HOMO}}$ as molecular descriptors
Fenton Treatment of Landfill Leachate

Raw leachate → After $H_2O_2$ addition → Oxidation → Coagulation → Flocculation → Supernatant → Sediments

Chemical cost for leachate treatment ($/m^3$)

- pH = 3.5
- $H_2O_2/Fe^{2+} = 1.8$

$\eta_{process} = 0.38 L_{COD} + 0.09$

Average $$/m^3 = 16.0 \exp (-1.86 L_{COD})$

$r^2 = 0.98$

COD (mg/L) / available O$_2$ (mg/L)

$0.00$ $0.25$ $0.50$ $0.75$ $1.00$ $1.25$

Chemical cost for leachate treatment ($$/m^3$)

$0$ $5$ $10$ $15$ $20$ $25$

$0.0$ $0.2$ $0.4$ $0.6$ $0.8$ $1.0$

$1.00$ $1.25$ $1.00$ $0.75$ $0.50$ $0.25$ $0.00$

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FIU Resources for Further Information

University Graduate School
gradschool.fiu.edu

About FIU
fiu.edu/about-us

College of Engineering & Computing
cec.fiu.edu

Department of Civil & Environmental Engineering
cee.fiu.edu
Dear Ph.D. Student Applicant:

If you have applied and been admitted to our Ph.D. program, please consider applying for a travel grant to come to Miami, Florida to visit FIU, the Engineering College, and our department, and to meet FIU CEE faculty and students.

Visit cee.fiu.edu for more information.

Contact Person: Ms. Rachel Garcia
rgarci04@fiu.edu or (305) 348 6875