Graduate Studies

Structural Engineering, Mechanics, and Materials

STRUCTURAL ENGINEERING, MECHANICS AND MATERIALS

offers graduate instruction and research in structural analysis and design, behavior of structural systems, earthquake engineering, engineering science and mechanics, high-performance materials, computer-aided engineering, and intelligent engineering learning environments. The faculty, students, and staff are encouraged to form partnerships to create an environment that fosters learning, discovery, and creativity.

The faculty are leaders in their respective fields and are committed to developing in their students the skills needed to be successful in the structural engineering profession. The program's academic and research activities have earned an international reputation for excellence in areas such as creative use of advanced structural materials and composite systems to improve the infrastructure, earthquake engineering, computer-aided structural engineering software that is used by hundreds of companies worldwide; cladding effects on, and hybrid control of, the response of tall buildings to earthquake and wind; steel connection design and behavior; and structural reliability and risk assessment.

Opportunities exist for students to become involved in research activities that promote multidisciplinary solutions to civil engineering problems of national and international importance.

RESEARCH AREAS

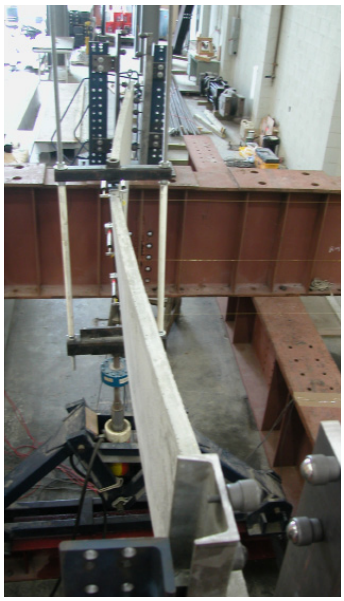
- Auto-adaptive Materials
- Computational Mechanics and Structural Analysis
- Computer-Aided Structural Engineering (GTSTRUDL)
- Durability of Construction Materials
- Earthquake Engineering
- Engineering Learning Environments
- High-performance Concrete
- High-performance Steel
- Horizontally Curved Bridges
- Industrial Buildings
- Masonry Structures
- Nano/Microstructure of Cement-based Materials
- Polymeric Composite Materials
- Protective Systems
- Quantitative Nondestructive Evaluation
- Rehabilitation of Structural Systems
- Reliable Engineering Computing
- Risk Analysis
- Seismic Hazard Mitigation
- Smart Materials and Structures
- Solid Mechanics in Small Scales and Geometric Mechanics
- Steel Connections
- Structural Control
- Structural Health Monitoring
- Structural Reliability

FACILITIES

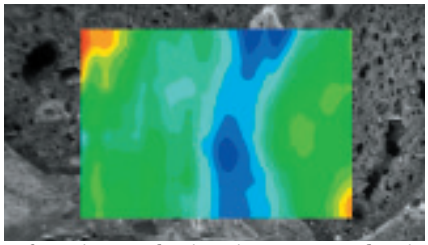
The School of Civil and Environmental Engineering at Georgia Tech is equipped with state-of-the-art laboratories and instruments, appropriate for all aspects of modern structural engineering and structural mechanics and materials research. Some of these are:

- An 18,000 sq ft Structures and Materials Laboratory with an 8,000 sq ft strong floor, an L-shaped reaction wall with capacities of 100 to 300 kips, and two 30-ton-capacity cranes.
- A broad range of universal testing machines, with capacity to 400 kips
- Specialized facilities for mechanical testing with infra-red thermography and photoelastic stress/strain analysis
- A nondestructive evaluation/optics laboratory
- A laser scanning confocal microscope
- Numerous high-performance workstations equipped with state-of-the-art software in structural engineering and mechanics.

Full-scale testing of unreinforced masonary building.

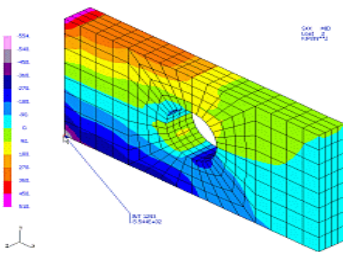


Lateral stability tests of reinforced and prestressed concrete beams.

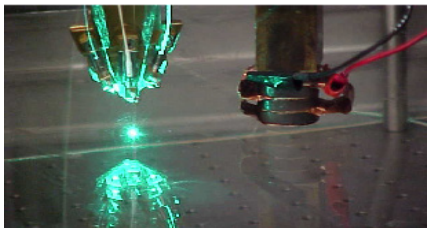


Deformation map showing microstructure and strain in lightweight aggregate concrete undergoing creep.

Students prepare test samples of Cenocell, a new material made from coal ash.

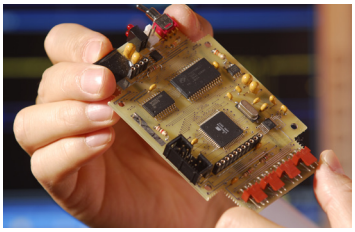


3D finite element modeling and simulation using GT STRUDL software.



Fiber optic laser interferometer for structural damage detection.

Use of fiber reinforced polymer deck panels for rapid repair of bridge structures.

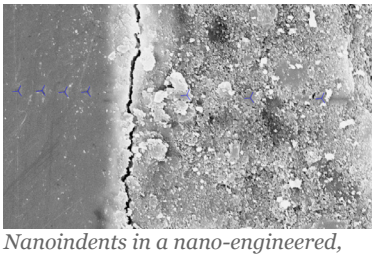


'Smart' wireless sensing device for structural health monitoring and control.

Graduate Studies
Structural Engineering, Mechanics, and Materials

SELECTED COURSES

- Advanced Applied Mathematics in Engineering
- Advanced Dynamics and Smart Structures
- Advanced Mechanics of Composites
- Advanced Strength of Materials
- Computational Methods in Mechanics
- Damage, Failure and Durability of Composite Materials
- Design by Inelastic Analysis
- Design of Polymer Composite Structures
- Durability of Cement-based Materials
- Earthquake Engineering
- Engineering Program Methods
- Experimental Stress Analysis
- Finite Element Method of Structural Analysis
- Manufacturing of Composites
- Materials Science of Concrete
- Matrix Structural Analysis
- Nonlinear Design of Frame Structures
- Nonlinear Finite Element Analysis
- Plasticity and Viscoelasticity
- Prestressed Concrete
- Random Vibration
- Rehabilitation of Existing Structures
- Reinforced Concrete Members
- Reinforced Concrete Slab Systems
- Structural Dynamics
- Structural Modeling
- Structural Reliability
- Structural Steel Design
- Structural Systems
- Theory of Elastic Stability
- Wave Propagation in Solids



Nanoindents in a nano-engineered, fiber-reinforced, ultra-high performance cementitious material.

FACULTY

Nelson C. Baker, Ph.D., Associate Professor
Intelligent learning environments for engineering; applications of artificial intelligence and other computer-based techniques to solve engineering problems; and robotic applications to civil engineering.

Reginald DesRoches, Ph.D., Associate Chair and Professor
Auto-adaptive materials; earthquake engineering; structural dynamics; impact dynamics; design and analysis of bridge structures; protective systems; structural applications of smart materials.

Mulalo Doyoyo, Ph.D., Assistant Professor
Ultralight and 'green' materials, structures, and systems; micro-assembled structures, including lattice materials; development of lightweight materials with non-equilibrium microstructures.

Bruce R. Ellingwood, Ph.D., The Raymond Allen Jones Chair in Civil Engineering, College of Engineering Distinguished Professor
Structural reliability; probability-based design; structural loads; natural hazards; load combinations analysis; abnormal loads and progressive collapse; and probabilistic risk analysis.

Leroy Z. Emkin, Ph.D., Professor
Matrix analysis; numerical methods; design of steel structures; structural optimization; computer applications; advanced computer programming; large-scale application software development; and computer-aided engineering.

Barry J. Goodno, Ph.D., Professor
Earthquake engineering; structural dynamics; matrix structural analysis; hybrid control of structures; influence of nonstructural components on building response; vibrations; finite element analysis.

Rami Haj-Ali, Ph.D., Professor
Computational mechanics; nonlinear structural analysis; damage mechanics; constitutive models; micromechanics of composite materials; fracture mechanics; nonlinear finite elements; and articial neural networks in engineering applications.

Laurence J. Jacobs, Ph.D., Associate Dean and Professor
Quantitative nondestructive evaluation of civil engineering materials; wave propagation in solids, emphasizing guided waves, nonlinear methods and heterogeneous materials; signal processing techniques applied to nondestructive evaluation; and development of acoustic sensors for condition monitoring of structural components.

Lawrence F. Kahn, Ph.D., Professor
Structural concrete and masonry; high performance concrete for prestressed concrete bridges; self-compacting concrete; repair and rehabilitation of bridges and buildings; earthquake resistant design and retrofit.

Kimberly E. Kurtis, Ph.D., Associate Professor
Nano/microstructure, properties, and durability of cement-based materials; development of novel methods for multiscale characterization of infrastructure materials; high performance concrete; fiber-cement composites; applications of nondestructive evaluation methods to cement-based materials.

Roberto T. Leon, Ph.D., Professor
Behavior and design of steel and composite connections; seismic design of steel-braced frames and frames with partially restrained connections; seismic behavior of bridges; serviceability of composite floors; high performance materials.

Stanley D. Lindsey, Ph.D., Professor of the Practice
Concrete and steel structural analysis; structural design; distributed education.

Rafi L. Muhanna, Ph. D., Associate Professor
Computational solid and structural mechanics; uncertainty modeling; reliable engineering computing; structural reliability; finite elements.

David W. Scott, Ph.D., Associate Professor
Design of structures constructed using high performance materials; repair and strengthening of structures using advanced materials and technolgies; blast response of structures strengthened using FRP materials; viscoelastic characterization of polymeric materials; structural monitoring and damage detection.

Yang Wang, Ph.D., Assistant Professor
Structural health monitoring and damage detection; optimal decentralized structural control; smart materials and structures; wireless sensor network; structural dynamics and earthquake engineering.

Donald W. White, Ph.D., Professor
Computational mechanics; numerical methods; structural stability; steel structures; computer-aided engineering.

Kenneth M. Will, Ph.D., Associate Professor
Finite element analysis; structural stability; numerical techniques; computer graphics and visualization; offshore structures; and computer-aided engineering.

Arash Yavari, Ph.D., Assistant Professor
Solid mechanics in small scales; ferroelectrics; magnetoelastic and electroealstic interactions; lattice theories of solids; geometric continuum mechanics; configurational forces; and fractal fracture mechanics.

Abdul-Hamid Zureick, Ph.D., Group Leader and Professor
High-performance fiber-reinforced polymeric composite materials and structural systems; structural stability; design of steel structures; structural optimization; bridge structures; anisotropic elasticity.

School of Civil and Environmental Engineering, Graduate Program, Georgia Institute of Technology, Atlanta, GA 30332-0355
404.894.2246 (Phone) • 404.385.0571 (Fax) • gradinfo@ce.gatech.edu (Email) • http://ce.gatech.edu/academics/graduate