Graduate Tracks

STRUCTURAL ENGINEERING

Structural engineers plan, analyze, and design a wide variety of large-scale structures, including bridges, buildings, transmission towers and space structures. Structural engineers incorporate various materials in their designs, such as steel, concrete, timber, and composites. They need to understand the mechanical, thermal, elastic, and nonlinear properties associated with these materials as well as understanding the limits to which those materials can be pushed, and the impact of incorporation of new materials and how they can affect both mechanical properties and durability. Structural engineers also estimate strength, as well as deflection and acceleration response of structures under extreme loads and environmental factors, such as wind, earthquakes, temperature, and vibrations.

Research

Research activities aim to understand the behavior of materials, structures and systems, and to improve the structural response and design process under extreme loads, such as earthquakes, using advanced computational methods or test data. Specific topics and research expertise of each faculty member are listed below.

Faculty

Natassia Brenkus, Assistant Professor, PhD, PE, University of Florida (bridge engineering; prestressed and post-tensioned concrete design and repair; timber degradation; structural performance under hazard; concrete durability; laboratory and field evaluation; structural modeling; structural design codes and construction methodologies) Email: brenkus.4@osu.edu.

Lisa Burris, Assistant Professor, PhD, University of Texas at Austin (concrete durability including testing and remediation of ASR, sulfate attack, salt crystallization damaged, carbonation, chloride diffusivity, and corrosion of reinforcing bars; understanding and optimization of cement hydration; synthesis and testing of novel cementitious materials and characterization of supplementary cementitious materials; use of non-destructive test methods to evaluate concrete quality; life cycle analysis of concrete; modeling of concretedurability, development of concrete for novel applications). E-mail: burris.189@osu.edu. Webpage: https://u.osu.edu/burris.189/.

Tarunjit Butalia, Research Associate Professor, PhD, The Ohio State University, PE (engineering characterization including numerical modeling, laboratory, and field-scale testing, and beneficial use of natural and synthetic materials in sustainable engineered structures; coal combustion and other industrial by-products; structural composites for aerospace and civil infrastructure rehabilitation; computational and soil mechanics; geotechnical engineering; structural dynamics) E-mail: butalia.1@osu.edu; Webpage: https://ccp.osu.edu.

Jieun Hur, Assistant Professor of Practice, PhD, PE, Georgia Institute of Technology (structural modeling, analysis and design of buildings, bridges, critical facilities, and nonstructural components; nonlinear dynamic analysis, earthquake engineering, probabilistic risk assessment; structural health monitoring; structural mechanics of materials) E-mail: hur.55@osu.edu.

Anthony Massari, Assistant Professor of Practice, PhD, PE, LEED AP, California Institute of Technology (computational modeling, analysis and design of high-rise, long-span and specialty structures; earthquake engineering; structural dynamics; structural health monitoring; concrete and steel design; nonlinear structural analysis; sustainable building design) E-mail: Massari.8@osu.edu.

Daniel Pradel, Professor of Practice, PhD PE GE DGE, University of Tokyo (Geotechnical engineering,

geomechanical numerical modelling, and geotechnical earthquake engineering; performance of levees, dams, and slopes, subjected to major natural hazard events such as earthquakes and hurricanes; design of shallow and deep foundations for buildings, bridges, transmission towers, and other structures; analysis of the effects of wall flexibility, creep in soils, and construction techniques on earth retaining structures) E-mail: pradel.1@osu.edu.

Halil Sezen, Professor, PhD, PE, University of California, Berkeley (modeling, analysis and design of structures and their components; dynamic response and collapse of buildings; reinforced and prestressed concrete design, earthquake engineering and structural dynamics; evaluation and rehabilitation of buildings and bridges; nonlinear structural analysis; sustainable structural design; seismic evaluation; structural design codes; and structural performance of non-building structures under extreme loads) E-mail: sezen.1@osu.edu.

Abdollah Shafieezadeh, Associate Professor, PhD, Georgia Institute of Technology (high-fidelity modeling and analysis of structures including bridges, wharves, levees and floodwalls, and power distribution and transmission structures, reliability analysis of structures and infrastructure systems for extreme geologic and climatic hazards (e.g., earthquakes, hurricanes, and storm surge); deterioration modeling and analysis of structures; maintenance strategies and planning for infrastructure systems; passive, active and semi-active control of structures; resilience assessment and enhancement of infrastructure systems; life cycle analysis) E-mail: shafieezadeh.1@osu.edu; Webpage: http://ramsis.osu.edu.

Facilities

The Department of Civil, Environmental and Geodetic Engineering at The Ohio State University has over 18,000 ft^2 of space maintained for experimental research and teaching. The 9000 ft^2 structures and construction materials specific laboratories are equipped for preparation and testing of cement, concrete, coal combustion products (such as fly ash) and aggregates. Equipment for structural property testing and fabrication of experimental samples includes: a multitude of load test frames with load capacities up to 500 kips, capable of testing compressive, bending, and tensile capacity; a 55-kip hydraulic MTS system for dynamic loading; a 3 cubic foot rotary drum concrete mixer; and a 100% relative humidity curing room; and a humidity and temperature-controlled chamber. Equipment for concrete materials testing includes; Hobart mixers for paste and mortar samples; a TGA/DSC capable of analyzing samples from 20-1600 ºC and determining chemical makeup of powder samples; an isothermal calorimeter for assessment of clinker chemistry and crystallinity variations on cement reactivity; a freeze-thaw chamber; resistivity and UPV meters, a multitude of temperature-controlled ovens, equipment for determining chloride intrusion, and equipment for tracking autogenous and drying shrinkage as well as expansion due to sulfate attack and alkali silica reaction. Students and faculty also have access to state-of-the-art shared services facilities at Ohio State University, with access to scanning electron microscopes, X-ray diffractometers, and atomic force microscopes: https://cemas.osu.edu/.

The department maintains specialized computational facilities to address the needs of our programs. The facilities are under the auspices of the College of Engineering and consist of several computer laboratories. Students have 24-hour, 7-days-a-week keycard access. Some are available on a walk-in basis; others provide studio settings for advanced users. At least 50 software packages are available, including the SAP2000, ANSYS, ABAQUS, AutoCAD, various GIS and image processing packages. The University also provides an environment that gives students access to a variety of computer resources on campus, in Ohio, and on the Internet.

Academic Program

Master of Science (MS) Program. Two types of MS programs are offered: thesis and non-thesis. The thesis option requires 30 graduate credit hours, including 6 credit hours for research and thesis. The non-thesis option requires 33 graduate credit hours. A minimum of 6 credit hours of coursework to develop depth in structural engineering is to be selected from the current Graduate Committee-approved Table A listing. A minimum of 6 credit hours of coursework to develop breadth in structural engineering is to be selected from Table B. At least 3 credit hours of mathematics or statistics is also required.

Doctoral Degree (PhD) Program. The PhD degree requires 80 graduate credit hours, including 30 credit hours for research and dissertation. A minimum of 12 credit hours of structural engineering coursework (Table A) is required. An additional 8 credit hours of courses from Table B are alsorequired.

Please see the Civil Engineering Graduate Studies Program Handbook for more information.

Course Offerings

TABLE A	Title	Credits
CIVILEN 5168	Introduction to Finite Element Method	3
CIVILEN 5320	Intermediate Structural Steel Design	3
CIVILEN 5350	Intermediate Reinforced Concrete Design	3
CIVILEN 5360	Bridge Engineering	3
CIVILEN 5370	Prestressed Concrete Design	3
CIVILEN 6300	Structural Dynamics	3
CIVILEN 7330	Earthquake Engineering	3
CIVILEN 7350	Advanced Reinforced Concrete	3
TABLE B	**Title**	**Credits**
Recommended Departmental Table B Courses		
CIVILEN 5510	Durability and Condition Assessment of Reinforced Concrete Structures	3
CIVILEN 5561	Principles of Soil and Rock Mechanics	3
CIVILEN 5571	Principles of Foundation Analysis and Design	3
CIVILEN 6510	Advanced Concrete Materials	3
CIVILEN 7320	Structural Reliability	3
CIVILEN 8810	Construction Intelligent System and Simulation I	3
Other Recommended Table B Courses		
CONSYSM 5670	Green Building and Sustainable Construction	3
CSE 5243	Introduction to Data Mining	3
CSE 5249	Intermediate Studies in Databases	3
CSE 5361	Numerical Methods	3
CSE 5441	Introduction to Parallel Computing	3
CSE 5521	Survey of Artificial Intelligence I: Basic Techniques	3
CSE 5523	Machine Learning and Statistical Pattern Recognition	3
CSE 5526	Introduction to Neural Networks	3
CSE 5531	Introduction to Cognitive Science	3

CSE 6441	Parallel Computing	3
CSE 6449	Advanced Studies in Parallel Computing	3
CSE 6539	Advanced Studies in Artificial Intelligence	3
ECE 5551	State-Space Control Systems	3
ECE 6200	Signal Processing	3
ECE 6202	Stochastic Signal Processing	3
ECE 7854	Nonlinear and Adaptive Control	3
ECE 7858	Intelligent Control	3
ECE 7868	Pattern Recognition and Machine Learning	3
ISE 5200	Linear Optimization	3
ISE 5850	Operations Research Models and Methods	3
ISE 6200	Fundamentals of Optimization	3
ISE 6210	Integer Optimization	3
ISE 7200	Algorithms for Nonlinear Optimization	3
ISE 7210	Large Scale Optimization	3
MATH 6251	Theory of Probability I	3
MECHENG 5134	Introduction to Vibrations of Deformable Solids	3
MECHENG 5139	Applied Finite Element Method	3
MECHENG 5374	Smart Materials and Intelligent Systems	3
MECHENG 7040	Elasticity	3
MECHENG 7100	Introduction to Continuum Mechanics	3
MECHENG 7101	Constitutive Models in Continuum Mechanics	4
MECHENG 7163	Advanced Strength of Materials for Design	3
MECHENG 7250	Vibration of Discrete Systems	3
MECHENG 8038	Advanced Topics in Finite Element Method	2
MECHENG 8042	Nonlinear Finite Element Method	2
STAT 6450	Applied Regression Analysis	4
STAT 6520	Applied Statistical Analysis with Missing Data	3
STAT 6550	Statistical Analysis of Time Series	2
STAT 6560	Applied Multivariate Analysis	3
MATH (MS only)	Students pursuing an MS in Structural Engineering will consult with their advisor and choose courses from Statistics (4201 and above) or Mathematics (4512 and above) in order to fulfill their mathematics requirement. CIVILEN 5168 – Introduction to Finite Element Analysis, can be used to meet the MATH or Table B requirement, but not both.	3

Prospective students interested in learning more about admission and funding should visit ceg.osu.edu/degrees/prospective-graduate-students.