

COLORADO SCHOOL OF MINES

EARTH  ENERGY  ENVIRONMENT



Civil Engineering Graduate Studies at Colorado School of Mines





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Message from Dr. Terry Parker, Engineering Division Director

Engineering has historically been a field that applies scientific knowledge to the needs of society by producing technological devices and systems. As the complexity in our society grows along with improvements in lifestyle and an increase in world population, technology becomes embedded more deeply into the fabric of all of our lives. For the engineer, this translates directly into technology-based demands, opportunities, and challenges.

Graduate education is increasingly critical to today's engineer as the technologies that are addressed become more complex and the tool-set used to analyze problems and produce solutions becomes more technically and computationally intensive.

What was a solitary endeavor at a computer, a drafting table, or a work site has become a team activity requiring diverse, interdisciplinary skills. Today's engineers must be aware of modern techniques of measurement, analysis, and interpretation. They should be able to exploit sophisticated control systems and instrumentation, be familiar with advanced numerical modeling techniques and recent developments in engineering software and computer architecture, and have a good knowledge of data acquisition, processing, and visualization methods.



The Engineering graduate degree structure at Colorado School of Mines builds upon the foundation of an undergraduate engineering degree to produce a highly capable engineer with these qualities and specialization in the field of his or her choice. The graduate program in Engineering at Colorado School of Mines offers a range of degrees to reflect the diversity of student ambitions and needs. Degrees are offered in Engineering with specializations in Civil, Electrical, Mechanical, or Systems Engineering; Systems Engineering is constructed to provide an element of "interdisciplinarity" while facilitating the specialization that is critical to a graduate endeavor. Significant research areas are energy and power systems, bio-mechanics and engineering, energy conversion and full-cell development, controls and control systems, mechanics and nano-mechanics, geotechnical engineering, and structural engineering. ***Master of Science degrees can be constructed in a thesis or non-thesis format according to student needs; the traditional Doctor of Philosophy (Ph.D.) is also offered and emphasizes the classic depth of knowledge associated with state-of-the-art research.***

The strength of the education provided by the Colorado School of Mines Engineering Division is the faculty and the teaching and research interaction that they provide with graduate students. Any member of the faculty will be glad to talk with you regarding your educational aspirations and plans, and I would be happy to answer any questions that you might have. Please come and visit the Engineering Division at Colorado School of Mines as you consider the next step in your education.

Terry Parker, Professor and Division Director

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Research Overview

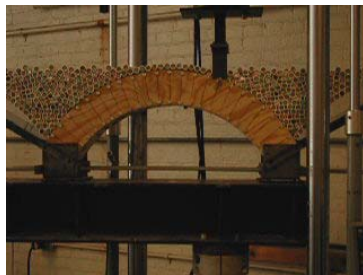
The Division of Engineering is always on the cutting edge of research. Whether through university, corporate, or student-sponsored projects, Colorado School of Mines is one of the leading engineering research facilities in the country. Much of the research occurs at the intersections of the traditional civil, electrical, and mechanical engineering disciplines; it is also common to pursue research and education that is at the intersections of the other fields represented at Colorado School of Mines, including geophysics, geological engineering, chemical engineering, earth sciences, environmental science, materials science, and physics. Our main research foci in civil engineering lie in the follow areas:

Geotechnical Engineering

Geotechnical Engineering is concerned with the engineering properties of natural earth materials. Almost all constructed projects require input from geotechnical engineers; additionally, mitigation of the impact of natural hazards such as earthquakes and landslides require geotechnical engineers to have an in-depth understanding of how soils respond to dynamic loads and groundwater conditions. Research at Colorado School of Mines includes advanced laboratory testing and field instrumentation, soil-structure dynamics, constitutive modeling, unsaturated soil mechanics, numerical methods in geomechanics, and probabilistic modeling and risk assessment.



Dr. Mike Mooney, his research team, and their GPS-enabled roller compactor.



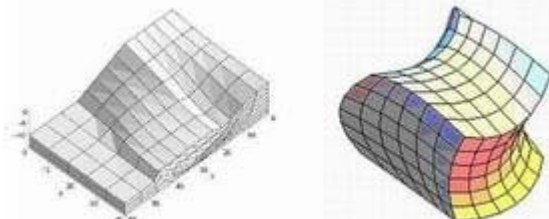
Scale model of a masonry arch subjected to point and backfill loading.

Structural Engineering

Structural Engineering involves the analysis, design, construction, and maintenance of our society's built infrastructure. Structural engineers create new construction materials, experimentally and analytically develop constitutive models for their mechanical properties, and examine how they perform in overall structural designs. Current research at Colorado School of Mines includes seismic analysis and design, nondestructive structural health evaluation, development and testing of self-consolidating and high performance concrete, plastic analysis of masonry arches, and usage of fiber-reinforced composites for the rehabilitation of existing structures.

Mechanics of Materials

Mechanics of Materials relates material behavior to the performance of engineering devices. Research in this field spans several scale levels, with the production of completely new materials based on atomic level properties to more traditional predictions of properties based upon grain boundary behaviors. Current research activity in this field at Colorado School of Mines includes inelastic constitutive modeling; interface characteristics of dissimilar materials; fracture of ductile and brittle composites; and numerical modeling techniques such as discrete element analysis, boundary element analysis, and finite element analysis.



Testing fundamental properties of finite elements for plasticity calculations.



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Degree Programs Overview

The Division of Engineering offers a Master of Science and Doctor of Philosophy in Engineering with specialties in Civil, Electrical, Mechanical, or Systems Engineering. The MS degree (thesis or non-thesis option) requires 30 credit hours of coursework and/or research. The Ph.D. program requires 72 credit hours of coursework and research, as well as the successful completion of a qualifying examination and the authorship and defense of a Doctoral Dissertation.

Admissions/Entrance Requirements

The requirements for admission to the graduate studies program are a baccalaureate degree in engineering, computer science, a physical science, or math with a grade-point average over 3.0/4.0; a GRE score of 650 (math) or higher; and a TOEFL score of 550 or higher (paper based) or 213 or higher (computer based) for applicants whose native language is not English. Applicants from an engineering program at Colorado School of Mines are not required to submit GRE scores. Transfer credit may be awarded for previous graduate-level coursework; undergraduate remedial coursework may be required to overcome technical deficiencies. Applications for admissions are accepted for both Fall and Spring enrollment. For more information and to apply online, please see Colorado School of Mines' Office of Graduate Studies' webpage (http://www.mines.edu/graduate_admissions).

Financial Support

Financial aid is available to outstanding students through student teaching assistant (TA) and research assistant (RA) positions. TA and RA contracts typically include full coverage of tuition, fees, health insurance, and a stipend. Awarding of all TA and RA positions are handled by the Engineering Division in conjunction with the admissions review process. The Application for Admission as found on the Graduate Studies website includes a section regarding interest in financial support; notification of financial awards is usually done at the time of admissions notification.

Course Offerings

Graduate students are required to complete a set of core coursework to prepare them for experimental and theoretical aspects of research in Civil Engineering. Additional courses are then selected from approved Civil Engineering Technical Electives. A selection of current graduate level courses is listed below:

EGGN 504: Civil Engineering Seminar
EGGN 531: Soil Dynamics
EGGN 532: Fatigue and Fracture
EGGN 533: Unsaturated Soil Mechanics
EGGN 534: Soil Behavior
EGGN 535: Introduction to Discrete Element
Methods
EGGN 540: Continuum Mechanics
EGGN 541: Advanced Structural Analysis
EGGN 542: Finite Element Methods for
Engineering
EGGN 545: Boundary Element Analysis

EGGN 546: Advanced Engineering Dynamics
EGGN 547: Timber Masonry and Design
EGGN 548: Advanced Soil Mechanics
EGGN 549: Advanced Design of Steel
Structures
EGGN 556: Advanced Design of Concrete
Structures
EGGN 560: Numerical Methods for Engineers
EGGN 598: Structural Dynamics
EGGN 599: Advanced Steel Construction
EGGN 642: Advanced Finite Element Analysis
for Engineers



Civil Engineering Graduate Studies at Colorado School of Mines

Civil Engineering Faculty

John Berger, Associate Professor, Ph.D. University of Maryland. Mechanical behavior of advanced materials, elastic wave propagation, and boundary element methods. jberger@mines.edu, 303-273-3682.

Joe Crocker, Senior Lecturer, Ph.D. University of Utah. Structural engineering, materials, and design. jcrocker@mines.edu, 303-273-3175.

D. Vaughan Griffiths, Professor, Ph.D. University of Manchester. Oil resource geomechanics, probabilistic modeling and risk assessment, slope stability and foundations, and finite element software development. d.v.griffiths@mines.edu, 303-273-3669.

Marte Gutierrez, James R. Paden Distinguished Professor, Ph.D. University of Tokyo. Computational geomechanics, sensor technologies, geotechnical earthquake engineering, and nano-geomechanics. mgutierrez@mines.edu, 303-273-3507.

Panos Kioussis, Associate Professor, Ph.D. Louisiana State University. Structural controls, optimization, and health evaluation; earthquake engineering; inelastic constitutive and finite element modeling. pkiousis@mines.edu, 303-384-2205.

Ning Lu, Professor, Ph.D. Johns Hopkins University. Unsaturated soil mechanics and fluid flow, chemical transport, heat transfer, stress, and deformation in soils. ninglu@mines.edu, 303-273-3654.

Mike Mooney, Associate Professor, Ph.D. Northwestern University. Geotechnical instrumentation and monitoring, machine-soil interaction, geoconstruction, construction vibration, and intelligent geosystems. mooney@mines.edu, 303-384-2498.

Candace Sulzbach, Lecturer, B.S., Colorado School of Mines. Structural design and surveying; faculty advisor for Colorado School of Mines' student chapters of the American Society of Civil Engineers, Society of Women Engineers, and Tau Beta Pi. csulzbac@mines.edu, 303-384-2498.

Alexandra Wayllace, Lecturer, Ph.D., University of Missouri, Columbia. Design of experimental procedures for the measurement of geotechnical properties in saturated and unsaturated soils. awayllac@mines.edu, 303-273-3961.

Judith Wang, Assistant Professor, Ph.D. Case Western Reserve University. Soil-structure dynamics, dynamic material properties, and earthquake engineering. judiwang@mines.edu, 303-273-3836.

Ray Ruichong Zhang, Associate Professor, Ph.D. Florida Atlantic University. Structural and geotechnical nondestructive evaluation and health monitoring, continuum mechanics, vibration theory, and stochastic processes and fields. rzhang@mines.edu, 303-273-3671.

