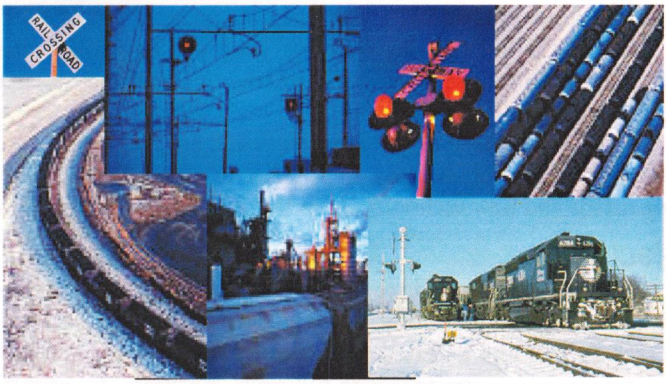
UNIVERSITY OF ILLINOIS

RAILROAD ENGINEERING PROGRAM

Education and Research



INSIDE:

Railroad Engineering at the University of Illinois

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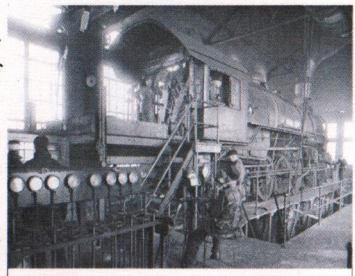
Railroad Engineering Program

Legacy

For over a century the University of Illinois at Urbana-Champaign (UIUC) has been among the leading academic institutions in rail transportation engineering. Talbot, Schmidt, Wright, Wetenkamp, and Hay are familiar and respected names in the annals of railroad engineering.

All were UIUC faculty who made important and lasting contributions to the field. These individuals and their students represent both the legacy, and the enduring commitment of UIUC to railroad engineering.



This lab built for instruction and research in the early 1900's, still stands on campus today.

Commitments

As we enter the 21st century, a vibrant program in railroad engineering at UIUC continues. UIUC has the strongest academic program in railroad engineering of any university in North America, complimented by the largest and most diverse program of research on the topic.

The UIUC Railroad Engineering Program recognizes the ever more important role of rail transportation, whether it be freight, passenger or urban transit.

UIUC is committed to further growth and development of its engineering teaching and research activity in support of the nation's need for talented young minds and new technologies in this important transportation mode.

Objectives

As a first step in rejuvenating its railroad engineering program, Dr. Christopher Barkan (formerly with the Association of American Railroads' Research & Test and Safety & Operations Departments) was hired in a new, full-time position to direct the effort following the retirement of Professor Ernest Barenberg.

Railroad Engineering Students on a field trip to CNIC Railway

Since his arrival, Prof. Barkan's has had two principle objectives, broadening the railroad engineering research program that was already well established thanks to Prof. Barenberg's efforts, and expanding the UIUC educational program.

Growth

The base of support for the UIUC railroad research program has been broadened by building on its core strength as an AAR Affiliated Laboratory.

Over a dozen new projects have been initiated, supported by AAR, FRA, NSF, RSI, TRB and individual railroad and railway supply companies. UIUC research results have been presented to the railroad community at a wide variety of national and international conferences and meetings in the past few years, including AREMA, AAR, TRB, WCRR and many others.

EDUCATION

Classes

The academic program has also undergone significant growth, expanding from one course in railroad engineering to the present number of four, with other new classes under consideration. Importantly, these classes are offered in the context of UIUC's extraordinarily broad and deep curriculum in engineering education.

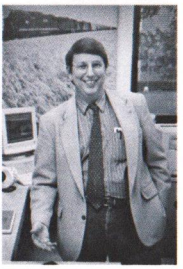
Standards

The UIUC College of Engineering is among the largest and highest ranked in the nation with 13 departments and over 500 faculty members. Admission standards for undergraduates are rigorous and expectations of faculty achievement are high. As such it is an appropriate institution to attract, teach, and develop the best and brightest minds in engineering and direct them toward the challenges of rail transportation.

Continuing Education

In addition to classes for matriculated students, UIUC recognizes the need for continuing education and distance learning options for the rail transportation community. To this end, UIUC has organized numerous conferences, workshops and short courses on railroad and related topics, and is interested in further development of these educational venues.

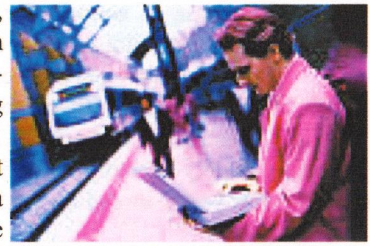
Faculty



UIUC has one full-time faculty position in railroad engineering (held by Prof. Barkan) and currently has a second opening. In addition, there is a strong base of knowledge on railroad engineering topics among a number of other faculty, thanks to UIUC's 20-year tenure as an AAR Affiliated Lab.

These individuals specialize in a variety of disciplines of direct relevance to rail transportation. They conduct

research on new and emerging technologies, and equally important, they teach classes on engineering subjects that are vital to a well-rounded education for railroad engineering professionals.



The skills of these faculty compliment Prof. Barkan's knowledge and they are a major factor in the overall strength of the UIUC railroad engineering program, which is fundamentally a multi-disciplinary, cross-departmental team effort at UIUC.

Challenges

Critical to the success of both UIUC and the rail transportation community is encouraging bright young students to seek education and pursue careers in railroad transportation, but there are several challenges.

By contrast to current, high-profile topics in engineering such as computers, communication, biotechnology, etc., rail transportation suffers from its low visibility with the general public, and a very limited understanding of the vital role it plays in modern society.

Perhaps even more important is the perception that rail transport is "low tech". Ironically, rail transportation is undergoing technological revolution in a number of respects. Some of this involves use of these new technologies to rail engineering applications, while others are challenging, cutting-edge developments in traditional engineering fields that are vital to the ever-changing demands for rail transportation technology.

In either case, they represent exciting and rewarding challenges for eager and inquisitive young minds. The key is to inspire students' interest by exposing them to these topics through classes, field trips, internships, visiting speakers, and research opportunities.

Establishment of a longer-term, reliable base of support for both the research and academic elements of the UIUC railroad program is vital to its continued success.

Research on improved thermite welds at UIUC Newmark Lab.

Attracting the most talented undergraduate students is enhanced by scholarships, conduct of research requires support for graduate students and faculty, development of new courses requires faculty time, classroom space and laboratory equipment.

THE FUTURE

Industry Support

A step toward achieving this goal was achieved when the George M. Krambles Foundation made a substantial donation to UIUC in support of its transportation engineering program in civil engineering with emphasis on rail transit. More recently, the CN Foundation provided a generous endowment supporting railroad engineering research fellowships at UIUC.


Field research by UIUC on detecting broken rails.

The railroad and railway supply industries can help ensure that UIUC continues to educate a new generation of railroad engineering and transportation professionals by supporting the continued development of its railroad educational and research programs.

There are three key ways to accomplish this: funding, internships and employment opportunities.

Funding - This is particularly important because it helps attract the best students to the program and provides the stability that enables faculty and students the time to concentrate on teaching, studies, and research in rail transportation engineering.

Internships and coops - These provide first-hand experience to students who are considering careers in rail transportation and help them develop understanding and interest in key aspects of the field.

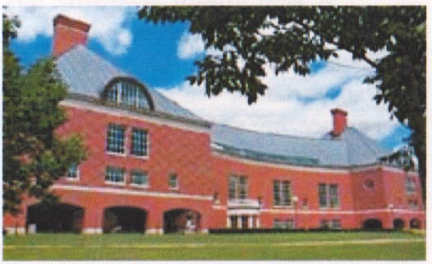
Employment opportunities - There is a shortage of engineers in all fields today and the rail industry is competing with other industries for the best students who will receive many offers. It is vital that timely, competive employment opportunites be available when graduates are looking for jobs, typically in the winter months for May graduates.

Summary

In short, if rail transportation is to have the talent it needs in the future, it must invest in education and research today. The University of Illinois at Urbana-Champaign has been teaching and advancing the field of rail transportation engineering for over 100 years, and is committed to continuing in this role in the 21st century.

W.W. Hay Collection

An important step in supporting the UIUC and North America's railroad research program has been the establishment of the William W. Hay Railroad Engineering Collection at the UIUC Grainger Engineering Library. At its core is the UIUC railroad engineering collection that includes thousands of books and technical journals, some of which date back over a century and a half. Recently, the Transportation Technology Center, Inc. selected UIUC to serve as its technical library and donated over 6,000 volumes from the AAR and FRA collections, including many difficult-to-find industry and government reports from around the world. The Hay Collection is almost certainly the largest assemblage of railroad engineering technical literature of its kind in North America. A new, on-line, digital search and retrieval system has also been developed to facilitate location of references from the Hay Collection.



W.W. Grainger Engineering Library

Railroad Engineering Courses

CEE 398RTE - Railway Transportation Operating Efficiency

Rail transportation requires infrastructure, vehicles, motive power and energy to move goods and people. Each of these factors interacts to affect the efficiency, energy requirements and economics of railroad operation. This course covers the influences of rail traffic, railway location, track alignment, (distance, gradient, curvature), motive power, mechanics of train operation, train energy calculation, acceleration and braking, rail vehicle and train design; and an introduction to vehicle/track interaction.

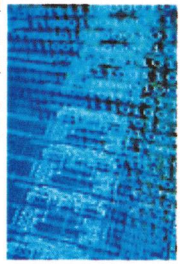
Students on a field trip to NS Decatur yard

Texts: Hay 1982. *Railroad Engineering - Part 1: Principles of Location and Operation*, and selected chapters from, Armstrong 1998. *The Railroad, What it is, What it Does.*

CEE 398RTO - Railroad Traffic Control and Operation

Rail transportation of passengers and freight requires specialized facilities, operating practices, and control systems to safely and efficiently effect their movement. This course covers railroad traffic control systems; line and

network operations; and terminal design and operation. Topics covered include: train movements, track circuits and other train position monitoring systems, signals and other traffic control systems, train scheduling methods, line capacity effects and analysis, interlockings, economics of traffic control systems, basics of network operation and an introduction to rail terminal function, design and operation.



Texts: Pachl 2002. *Railway Operation and Control*

CEE 398RCE - Railroad Civil Engineering

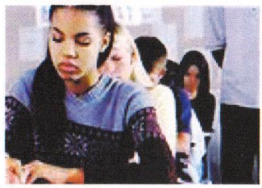
This course provides an in-depth understanding of railroad track system civil engineering concepts with an emphasis on design and maintenance. Track components and subsystems will be studied both individually, and as they interact as part of the overall track system. Students will gain a clear understanding of track loading response, design, evaluation, and maintenance. Included will be topics on track standards, condition assessment, and track maintenance and repair planning.

Texts: Hay 1982. *Railroad Engineering - Part 2: Principles of Maintenance and Construction*

CEE 498ART - Advances in Railway Technology

Rail transportation is undergoing dramatic changes in technology that are vital to its successful role in the 21st century. This is a graduate seminar course concentrating on these technological advances with a focus on understanding them and how they contribute to, and interact, to affect the overall transportation efficiency, capacity and reliability of railroads. Beyond understanding these technologies, an overarching theme is consideration of the factors that affect their implementation such as cost-effectiveness, compatibility with existing technology, etc. Topics covered include: new train control systems; high-speed passenger rail; advances in railcar and intermodal equipment design; new track systems; issues in vehicle/track interaction; "smart" systems for vehicle and track health monitoring; advances in propulsion and energy sources; new line, network control and scheduling systems, and other topics of interest.

Texts: Selected readings from recent technical journals, conference proceedings, industry & government technical reports and books.



FOR MORE INFORMATION ABOUT THE

RAILROAD ENGINEERING PROGRAM

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