

Colleges, universities develop courses, degree programs for rail-minded engineering students

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In response to the railroad industry's need for engineering talent to replace retirees and meet tomorrow's traffic demands, a growing number of colleges and universities are offering rail-related studies for undergraduate and graduate engineering students interested in pursuing careers in rail transportation.

Although many of the newer rail-related engineering studies fall under the category of elective credit courses, one university — Penn State Altoona — now offers a four-year degree in railroad engineering for undergraduates. University officials believe their program provides the nation's only four-year engineering degree in railroading.

Besides offering an array of elective classes that center on railroad content, colleges and universities also are exposing students to rail transportation through research projects. And not all those working on such projects are engineering students. With public awareness of rail's place in the national transportation system increasing, students pursuing other majors are interested in rail research as well, professors say.

"Students are seeing more of the data that confirms the fact that railroads represent opportunities for employment," says Jerry Rose, professor of civil engineering at the University of Kentucky (UK) College of Engineering. "They also see the statistics on freight-ton miles and growth of business activities in the industry. From that standpoint, the proof becomes even more compelling that the rail industry is not a one-year deal or a fly-by-night need that will evaporate, but a need that will continue."

The UK Department of Civil Engineering currently offers three elective courses in rail transportation: Railway Freight and Passenger Operations and Intermodal Transportation; Railroad Facilities Design and Analysis; and Urban Mass Transit. Students taking those classes typically are seniors. Freshmen engineering students enrolled in Introduction to Civil Engineering and juniors enrolled in the required Transportation Engineering classes are provided lectures about the rail industry.

Additionally, research opportunities are available to undergraduate and graduate students, which enhances their education by further exposing them to the rail industry, says Rose.

"We are primarily interested in evaluating innovations that appear to be beneficial to the railroads by reducing cost and improving output, which increases railroads' performance and makes rail competitive with other transportation modes," he says.

The potential to conduct research also helps attract students to the Rail Transportation Program (RTP) at Michigan Technological University. Launched in 2007, the program features three elements: education, projects and research, and events and extracurricular activities.

Educational courses cover railroad engineering, a rail transportation seminar, and railroad track engineering and design. Recently, the university added a class on transportation and logistics management — with a significant component focused on rail — for students enrolled in the university's business school. Moreover, the department is developing a new certificate program in rail that would be offered to undergraduate and graduate students, says Pasi Lautala, Michigan Tech's RTP director and assistant professor of civil and environmental engineering.

"We're definitely seeing an increase in students who are interested in rail," says Lautala, adding that not all those students are enrolled in the engineering program.

When the RTP was launched seven years ago, about 10 to 15 students took a course or were involved in a rail project or extracurricular activity through the school's American Railway Engineering and Maintenance Association (AREMA) chapter; today, that number is closer to 75, Lautala says.

Michigan Tech also is hearing from a more diverse group of employers interested in hiring the school's engineering graduates with rail-industry knowledge. Now, in addition to Class Is, students are being recruited for jobs with short-line and passenger railroads, transit agencies, state departments of transportation and engineering consulting firms.

A National Coalition Focused On Research

Some of Michigan Tech's students learn about the industry through participation in a research or senior project focused on rail. To that end, both Michigan Tech and UK are among a coalition of seven universities active in the National University Rail Center (NURail), a rail-focused transportation research center that's part of the U.S. Department of Transportation's (USDOT) Research and Innovative Technology Administration (RITA) program. Established by a grant issued in January 2012, NURail is the first USDOT-RITA Tier 1 University Transportation Center focused on advancing rail transportation in North America. The effort is part of a national attempt to "reverse the trend begun in the 1950s favoring air and highway transportation education over rail," according to a statement on the USDOT-RITA website.

Primary research focuses on railroad infrastructure, vehicles and systems. Heading the university coalition is the University of Illinois at Urbana-Champaign (UIUC), which has been a leader in rail engineering education and research for more than a century. Through NURail grants and matching funding from the rail industry, Michigan Tech students completed senior design and enterprise projects over the past two to three years, Lautala says.

Also under NURail, the coalition has worked to share rail course content online with other colleges and universities, now known as "NURail affiliate" campuses. About 14 universities are involved in the program, resulting in more campuses offering a full course in rail engineering or at least integrating a few sessions on rail into their basic transportation programs, Lautala says.

"There's no doubt there are many more universities interested in the rail field" as a result, he says.

Another way to gauge the interest: the increase in AREMA student chapters. Michigan Tech was among the first schools to establish one.

"There's been an explosion in interest in forming AREMA chapters over the last three or four years. And starting a new chapter requires more than just student interest; you have to find a faculty member who's interested in advising the chapter," says Lautala.

In addition to Michigan Tech, UK and UIUC, student chapters have been established at Brigham Young, North Carolina State, Oregon State, Pennsylvania State, Rose-Hulman Institute of Technology, University of Alberta, University of British Columbia, University of Manitoba, University of Nevada-Las Vegas, University of South Carolina, University of Tennessee-

Knoxville, University of Toledo, University of Wisconsin-Madison and Virginia Tech, according to the AREMA website.

One way AREMA has fostered interest in expanding railroad education on college campuses is through the Railway Engineering Education Symposium (REES), which AREMA's Education and Training Committee (Committee 24) developed and launched in 2008. Presented every other year, the symposium aims to encourage and support faculty members who are interested in adding rail content to their engineering curricula.

The initial gathering was organized in response to the small number of tenured or tenure-track faculty with railway engineering expertise, says Michael Pochop, vice president of Hanson Professional Services Inc. Since then, REES has accomplished that as well as helped raise engineering students' awareness of railroading as a career option, he adds.

The most recent REES was held June 23-25 at Johnson County Community College (JCCC) in Overland Park, Kan. The symposium attracted a mix of new and returning professors, and featured two days of presentations and discussions of railway engineering materials, and current and future research. Attendees also toured the BNSF Railway Co. training facilities at JCCC, home of the National Academy of Railroad Sciences, a JCCC-BNSF partnership. JCCC offers railroad degrees and "fast-track certificates" in coursework for aspiring railroad workers.

Academia Answering The Industry's Call

Pochop believes the higher education community is answering the industry's call for more formal academic training in railway engineering.

"I think we're seeing a good, significant response over where we were maybe five years ago," he says, noting the growth in AREMA student chapters. And he hopes the REES will continue to fuel that response. One campus where REES has helped make a difference is the University of South Carolina, which has added more railway education to the engineering program in recent years, Pochop says. Professor Dimitris Rizos, who directs the university's Advanced Railroad Technology Group-Civil and Environmental Engineering, was one of the symposium's new attendees in 2010 and returned as a presenter in 2012 and 2014. In June, Rizos was recognized with the 2013-2014 "Technical Merit Award" of the American Society of Civil Engineers' South Carolina section for creating the Advanced Railroad Technology Group and expanding the level of technical excellence in railroad engineering.

Meanwhile, railway engineering as an academic discipline has been re-established at the University of Delaware (UD) after becoming inactive following the 2004 retirement of Arnold Kerr, a UD professor who taught engineering mechanics and railway track engineering. Kerr also founded the Institute for Railroad Engineering. The program was revived after railway civil engineering consultant and researcher Allan Zarembski joined the faculty in 2012. He was offered the position of research professor and director of the Railroad Engineering and Safety Program at UD's Department of Civil and Environmental Engineering after he retired from ZETA-TECH Associates Inc., a rail technology company he established in 1984.

The department now offers core courses such as an introduction to railroad engineering, railroad safety and derailment engineering, and advanced railroad engineering and maintenance. In addition, a host of elective courses are being offered, including one in railroad geotechnical engineering scheduled for spring 2015. Most students enrolled in the courses are seniors or at the graduate level, says Zarembski. Recently, the university established a railroad engineering certificate program of online courses for graduate students, and is considering creating one for undergraduate students, he says.

Based on the feedback he receives from graduates, exposure to the rail industry during college provides them an advantage in the job market, says Zarembski.

"We've placed engineers with railroads, and a lot of engineering companies that do railroad work are interested in our students," he says. "I have transit agencies that are interested, as well."

Because UD is located on the Northeast Corridor, most of its students are used to seeing — if not riding — trains. Still, even engineering majors are unfamiliar with the myriad career opportunities that rail transportation offers, Zarembski says.

"A lot of students are not aware that the rail industry is vibrant, growing and technologically advanced," he says. "They find that fact to be an interesting revelation. In all my introductory lectures, I work on the assumption that students know nothing about railroads."

Looking ahead, the university anticipates adding to its rail-education options online, a trend Zarembski and other educators say will continue.

The growth of rail education isn't occurring only at the four-year and graduate-level institutions: Some community colleges are being called on by the rail industry to offer two-year associate degrees. One example is Gateway Community College in New Haven, Conn., which offers a two-year associate in science degree in railroad engineering technology.

The impetus for Gateway's program was a conversation held five years ago between Paul Silberquit, now the division director of Gateway's Engineering and

Applied Technologies Department, and Fred Gill, a talent acquisition specialist at MTA Metro-North Railroad. Gill was trying to figure out how Metro-North would find enough workers to replace experienced railroad staff that would qualify for retirement in the next few years.

"Our initial conversation was about offering training for [Metro-North] employees, but our conversations brought to light the fact that the rail industry is facing a large number of retirees," says Silberquit.

Today, Gateway's railroad engineering division offers two programs: communications and signaling, and electromechanical equipment. Although the conversation began over Metro-North's brain drain, Gateway graduates are being prepared for jobs with Amtrak and commuter- and transit-rail agencies operating throughout the Northeast Corridor. Moreover, Silberquit says he's been talking with a Class I about developing an educational option focused on freight railroads. He hopes to add rail-content class sections in the future, but first has to recruit faculty to teach them.

Representatives of all the campuses interviewed for this article say enrollment in their rail education programs has been increasing, a trend they anticipate will continue into the foreseeable future. As a result, they expect other colleges and universities will start or add to rail-specific courses — both online and on campus.

To Degree Or Not To Degree

Whether those academic endeavors will result in full-fledged majors or degrees in rail education remains to be seen. Penn State Altoona decision-makers took the full-fledged degree approach when they introduced a four-year bachelor's degree in rail transportation engineering three years ago. The degree was developed at the urging of railroad and transit industry executives. Among those encouraging the degree program's creation was Norfolk Southern Railway, which donated \$100,000 through its foundation to get it started.

Not all academic leaders agree that more railway-engineering degree programs — at least at the undergraduate level — are necessary to produce the next generation of rail experts. A versatile education within the engineering major combined with rail-focused courses, internships and research will get bachelor-degree candidates on the right track, those professors say.

Regardless of which path today's students take, professors do agree that higher education has come a long way in recent years toward stemming the brain drain of railway engineering professionals.

"When [my generation] came through engineering school, railroads were never mentioned," says UK's Rose. "Schools today are making tremendous strides, no question about it."