

May 2020



# ENGINEERING SECTOR ANALYSIS



**Kentucky Council on  
Postsecondary Education**

.ll Emsi

# KY CPE

## President

### Aaron

### Thompson



# CPE WEBINAR EVENT: ANALYSIS OF ENGINEERING IN KENTUCKY

THURSDAY, MAY 28, 1:30 ET | REGISTER: [CPE.KY.GOV](http://CPE.KY.GOV)

The Council on Postsecondary Education will hold a webinar to discuss its new report, Engineering Sector Analysis in Kentucky, with panelists representing economic, higher education and engineering sectors.



Suzanne Kopan Sakwa,  
Economist, Emsi



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Project Manager, Mason & Hanger



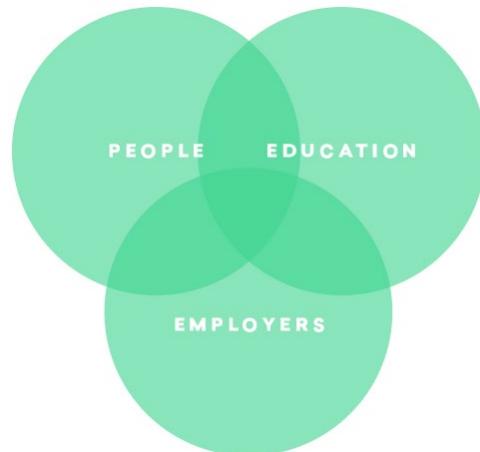
Anna Brown, Economist,  
Vice President of Higher  
Education Consulting, Emsi



David Mahan, Associate Vice  
President, Data, Research and  
Advanced Analytics, CPE



# About Emsi



Economic Modeling Specialist International (Emsi) founded in 2001

Data analytics: Emsi uses labor market data software and consulting to connect and inform people, education, and business.

Emsi covers more than 99% of the workforce, is compiled from a wide variety of government sources, job postings, and online profiles and résumés.

Focus on alumni outcomes to serve higher education

# Research Question

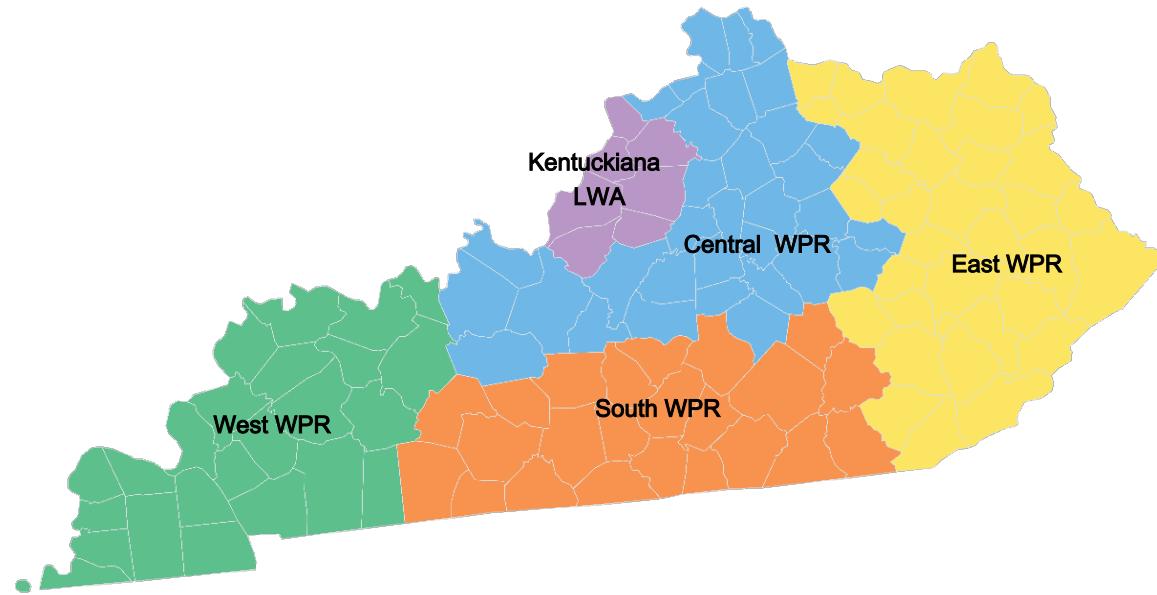
Where are there misalignments between the workforce demand and the supply of KY college and university engineering graduates?

- Job growth projections
- Comparing the number of annual job openings and graduates
- KY engineering alumni migration analysis
- KY engineers' wages
- Program demand gap analysis (academic program recommendations)



# INTRODUCTION

## Kentucky's WPRs and the Kentuckiana LWA



Kentucky has four Workforce Planning Regions (WPRs), and the city of Louisville and its surrounding counties comprise the Kentuckiana Local Workforce Area (LWA), an area within the Central WPR.



# INTRODUCTION

Industry overview: largest engineering employers in Kentucky's WPRs and the Kentuckiana LWA by industry

## INDUSTRY



Automobile & Light Duty Motor Vehicle Manufacturing



Engineering Services



Federal Government, Civilian, Excluding Postal Service



Federal Government, Military



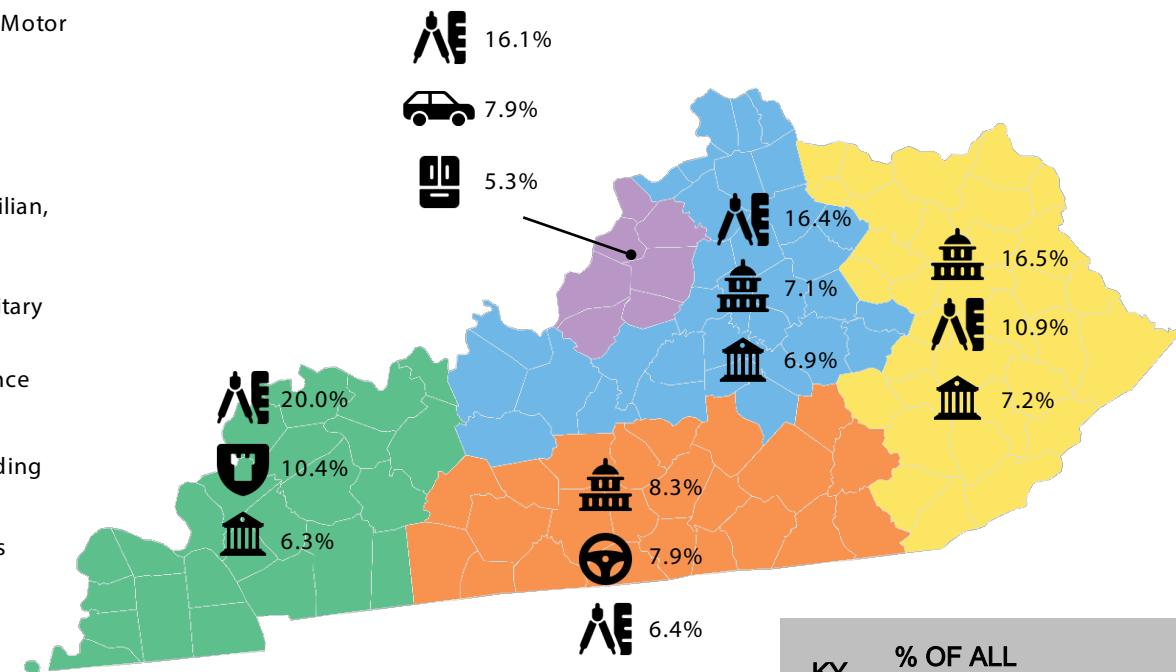
Major Household Appliance Manufacturing



State Government, Excluding Education & Hospitals



Other Motor Vehicle Parts Manufacturing



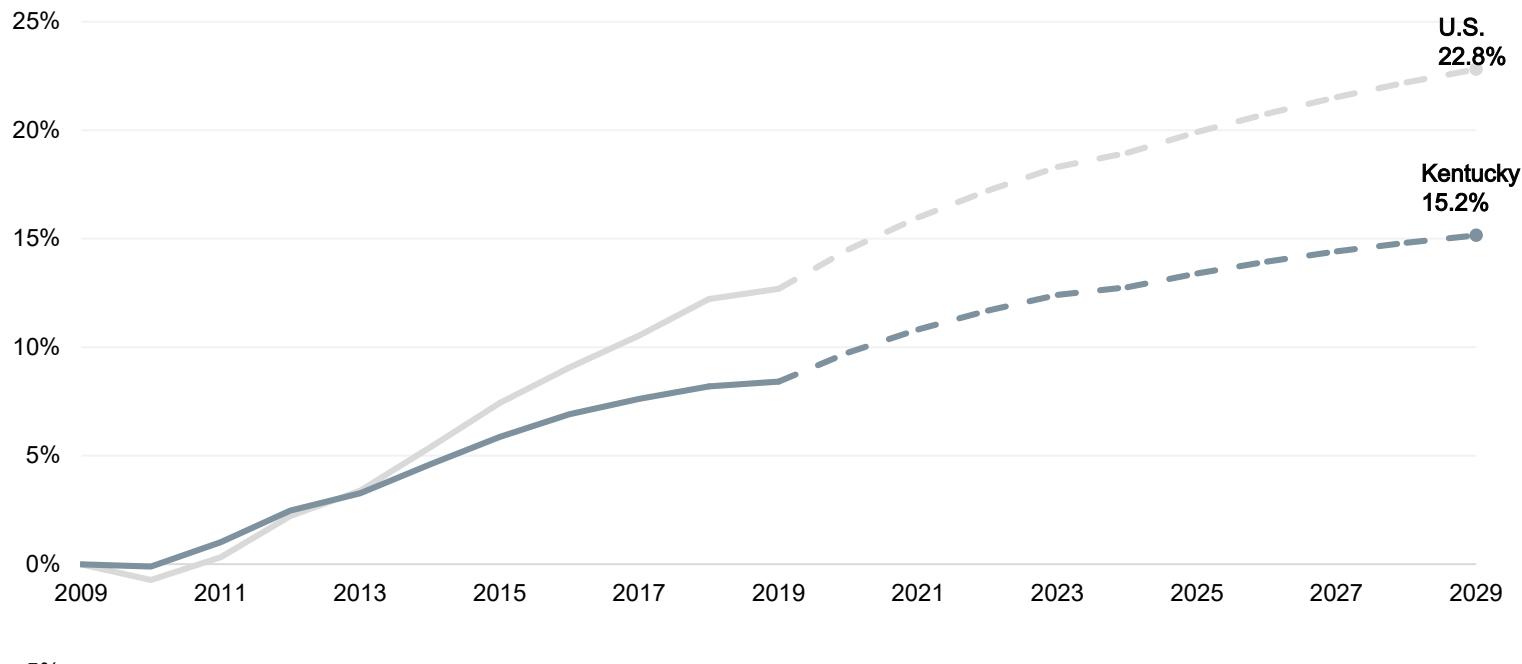
KY	% OF ALL ENGINEERING JOBS
Automobile & Light Duty Motor Vehicle Manufacturing	15.7%
Engineering Services	6.3%
Federal Government, Civilian, Excluding Postal Service	5.7%

Source: Emsi Employees & Self-Employed 2019.4.



# KENTUCKY TOTAL JOB GROWTH

Kentucky and U.S. job growth across all occupations



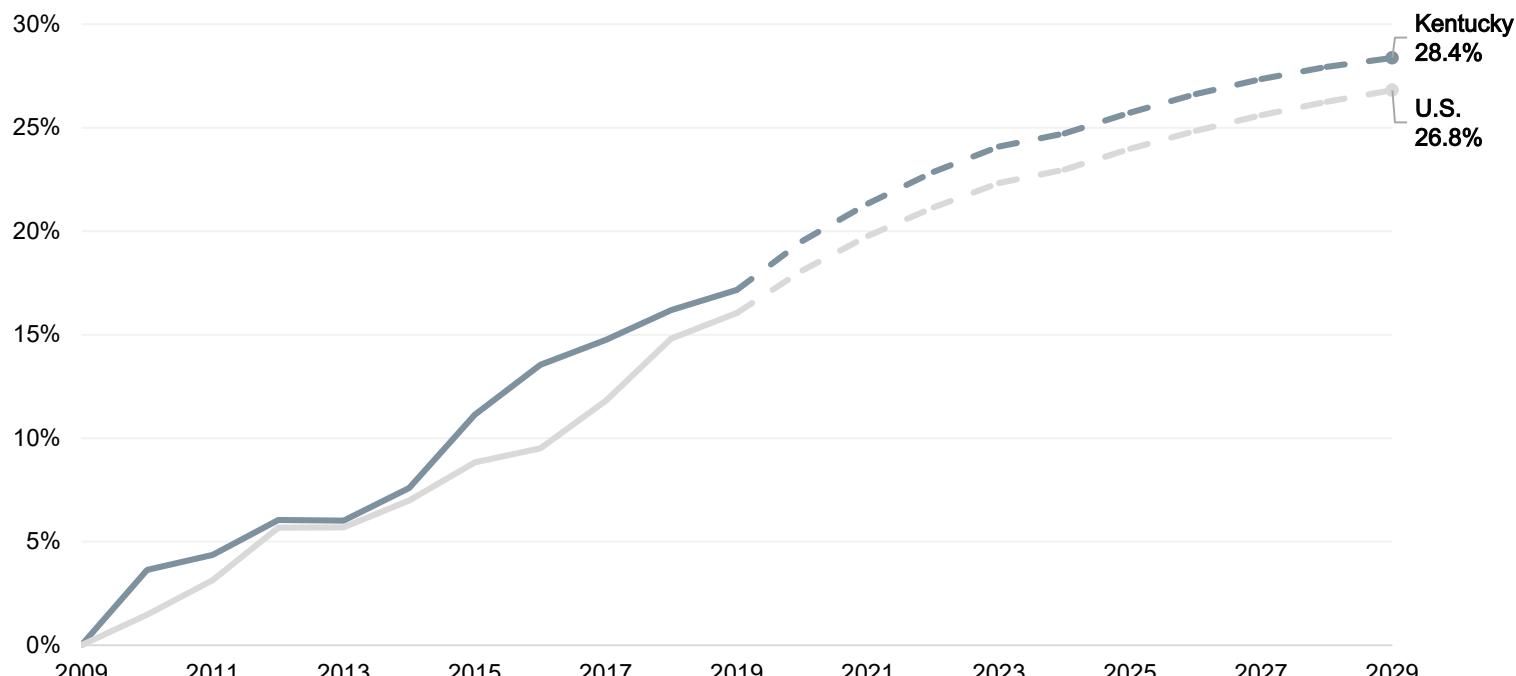
Source: Emsi Employees & Self-Employed 2019.4.

Kentucky's job declines in the years following the 2008 Recession were similar to that of the U.S. But after 2013, the state's job growth was less than that of the U.S. Using Emsi's job projections, job growth from 2009 to 2029 in Kentucky and the U.S. is expected to be 15% and 23%, respectively.



# KENTUCKY ENGINEERING JOB GROWTH

Kentucky and U.S. job growth across engineering occupations



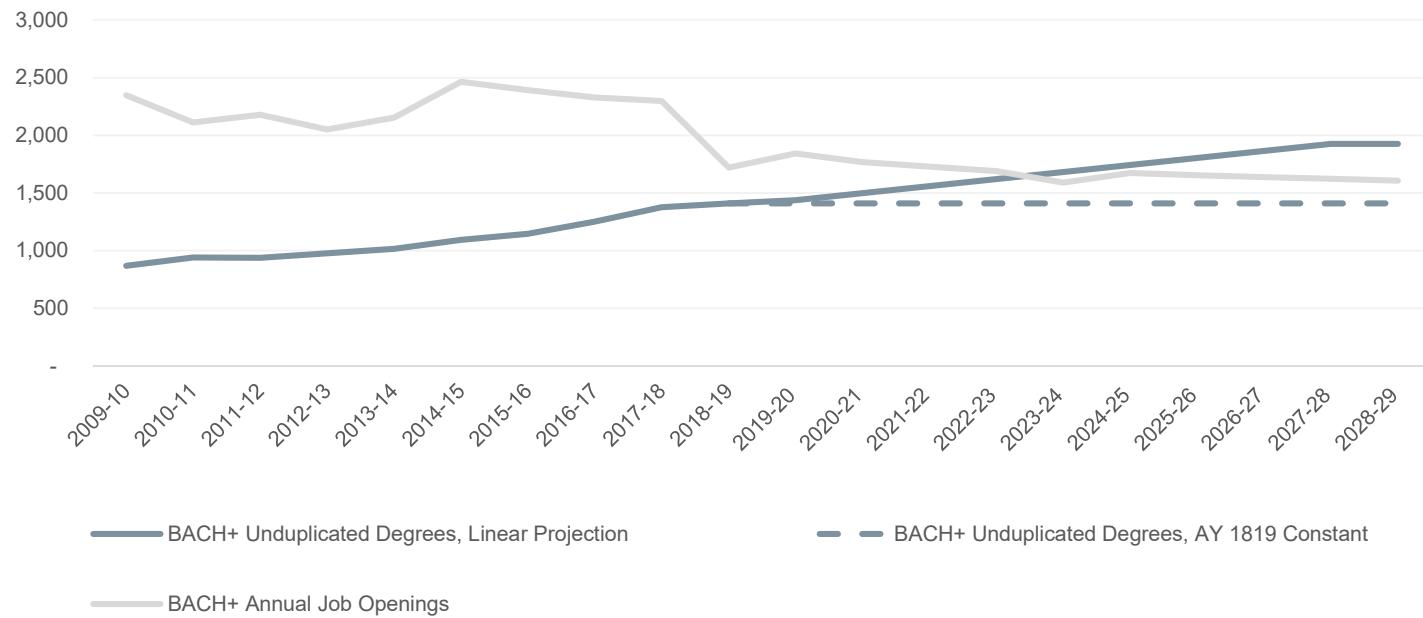
Source: Emsi Employees & Self-Employed 2019.4.

Contrary to the previous slide, Kentucky's engineering job growth consistently outperforms the job growth in engineering jobs across the U.S. Kentucky supported around 23,290 engineering jobs in 2009. By 2019, that number increased to around 27,290 jobs, for a 17.2% job growth. For context, the job growth for engineers in the U.S. between 2009 and 2019 was 16.0%. Engineering jobs are projected to grow by another 11.2% in Kentucky and 10.8% across the U.S. from 2019 to 2029, for a total 2009 to 2029 job growth of 28.4% for Kentucky and 26.8% for the U.S.



# JOB OPENINGS AND GRADUATES

High-level view across Engineering BACH+ historical and projected unduplicated degrees and annual job openings



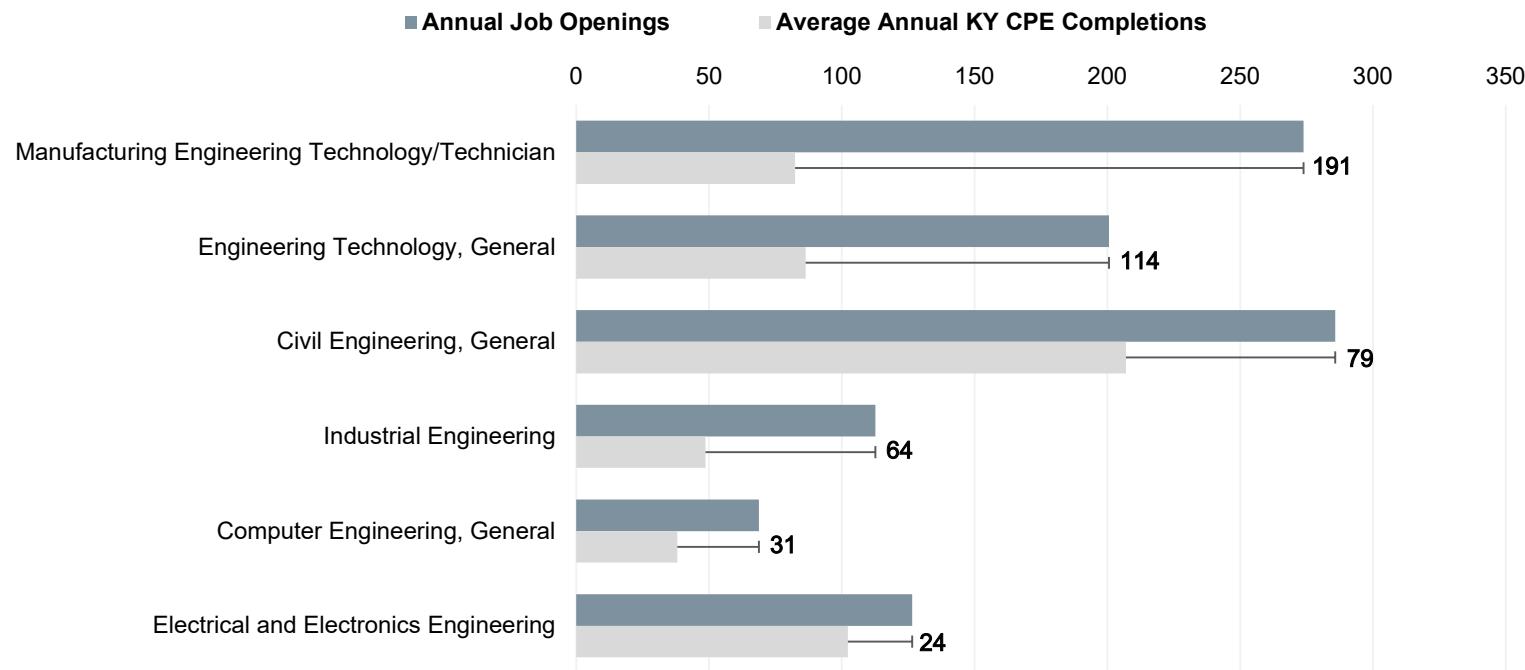
Source: Emsi's Employees & Self-Employed 2019.4 and <http://cpe.ky.gov/data/degrees.htm>.

Future Engineering BACH+ unduplicated degrees were projected using two different methods. Regardless of how they are projected, there will be a gap until at least 2023. If degrees are completed at the average pace from the past 10 years, then degree completion will never match demand.



# JOB OPENINGS AND GRADUATES

A large state gap exists for the industrial engineer occupation among BACH+ programs. Civil engineers also are in demand.



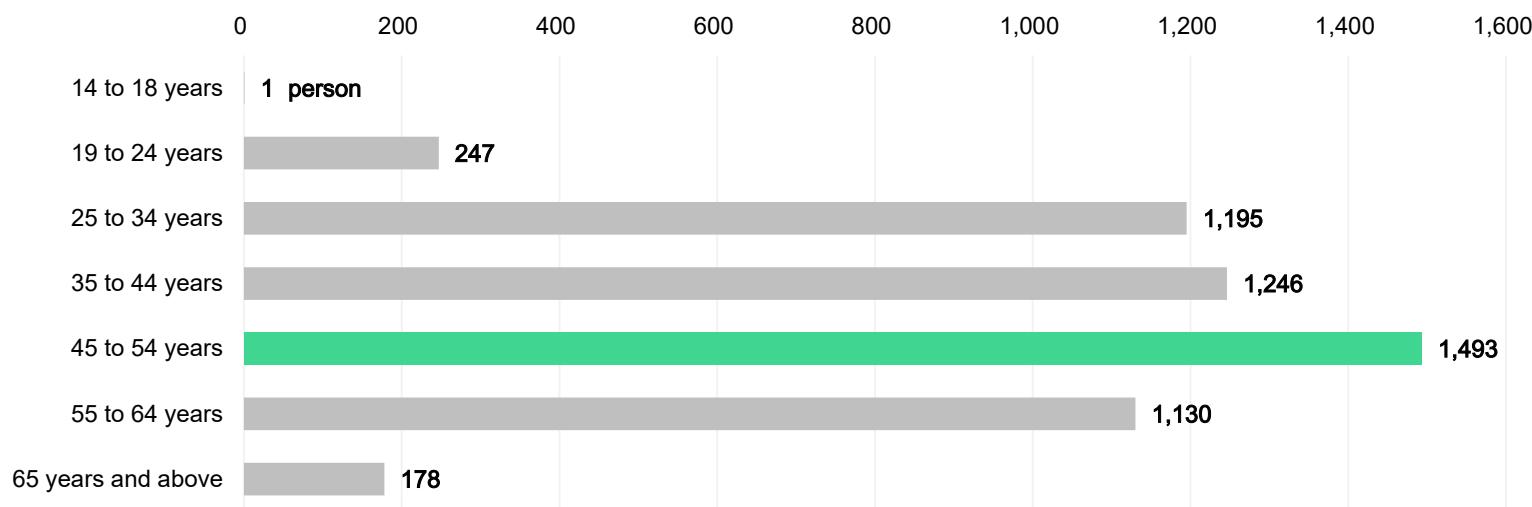
Source: Emsi program demand gap model.

Surplus in chemical and mechanical engineering graduates may find employment in the industrial engineering occupation.



# JOB OPENINGS POTENTIAL

## Kentucky's industrial engineers by age group



Source: Emsi Employees & Self-Employed 2019.4.

The most industrial engineers, the largest engineering occupation in the state, are in the 45 to 54 years age band, indicating a graying out of their workforce in the next decade. Electrical engineers and architectural & engineering managers also have many workers on the verge of retirement. Among all the engineering occupations, mechanical engineers are the most evenly split across the three age bands encompassing ages 25 to 54 years.



# Migration Analysis

In-state and out-of-state migration of Kentucky's engineering alumni\* by sector, with state and national comparisons of all alumni

SECTOR	ENGINEERING ALUMNI			ALL ALUMNI		
	PROFILES	% IN-STATE	% OUT-OF-STATE	PROFILES	% IN-STATE	% OUT-OF-STATE
			STATE			STATE
State University	22,045	51%	49%	477,491	56%	44%
KCTCS	2,384	68%	32%	67,634	68%	32%
AIKCU	1,220	72%	28%	57,111	65%	35%
Kentucky	26,835	54%	46%	748,030	56%	44%
U.S.	3,710,527	43%	57%	94,180,933	44%	56%

\* Based on students completing an engineering program (CIP codes 14 and 15) from an educational institution in Kentucky.

State universities include Eastern Kentucky University, Morehead State University, Murray State University, Northern Kentucky University, the University of Louisville, the University of Kentucky, and Western Kentucky University. KCTCS refers to the Kentucky Community & Technical College System, and AIKCU refers to the Association of Independent Kentucky Colleges & Universities.

Source: Emsi Profile Analytics.

Around 54% of the alumni from Kentucky's engineering programs remain in Kentucky, which is slightly fewer when compared to all majors (56%). However, more of Kentucky's engineering alumni stay in the state (54%) compared to engineering alumni in the U.S. remaining in their states (43%).



# MIGRATION ANALYSIS

Top occupations of Kentucky engineering alumni\* from all state institutions with top state 2019 salaries

OCCUPATION	2019 MEDIAN ANNUAL WAGE (STATE RANKING)					
	KY	IN	OH	FL	TN	TX
Industrial Engineers (n = 1,477) †	\$76,406 (4)‡	\$71,496 (6)	\$80,679 (3)	\$73,671 (5)	\$80,721 (2)	\$102,281 (1)
Mechanical Engineers (n = 1,139)	\$84,861 (2)	\$77,569 (5)	\$77,467 (6)	\$83,006 (4)	\$83,566 (3)	\$94,544 (1)
All Other Engineers (n = 849)	\$78,392 (3)	\$70,629 (6)	\$89,795 (2)	\$77,813 (4)	\$75,737 (5)	\$109,737 (1)
Architectural & Engineering Managers (n = 838)	\$114,665 (6)	\$116,343 (5)	\$128,574 (2)	\$124,396 (3)	\$119,372 (4)	\$154,152 (1)
Electrical Engineers (n = 658)	\$86,745 (4)	\$81,221 (6)	\$83,806 (5)	\$90,464 (3)	\$90,924 (2)	\$99,625 (1)

\* Based on students completing an engineering program (CIP codes 14 and 15) from an educational institution in Kentucky.

† The number in parentheses after the occupation name represents the number of engineering alumni from Kentucky institutions in the U.S.

‡ The number in parentheses after the annual wage represents the rank of the state from high to low wages across the occupations.

Source: Emsi Profile Analytics and Employees & Self-Employed 2019.4.

The top states where Kentucky engineering alumni move to are Indiana, Ohio, Florida, Tennessee, and Texas. Kentucky's wages are competitive with the states where alumni migrate to, except for the wages for architectural & engineering managers in Texas.



# MIGRATION ANALYSIS

Top occupations of Kentucky engineering alumni\* from all state institutions with top state 2009 salaries

OCCUPATION	2009 MEDIAN ANNUAL WAGE (STATE RANKING)					
	KY	IN	OH	FL	TN	TX
Industrial Engineers (n = 1,477) <sup>†</sup>	\$66,556 (6) <sup>‡</sup>	\$69,081 (3)	\$70,814 (2)	\$66,720 (5)	\$67,999 (4)	\$80,394 (1)
Mechanical Engineers (n = 1,139)	\$68,185 (5)	\$68,201 (4)	\$66,346 (6)	\$72,062 (2)	\$69,179 (3)	\$83,568 (1)
All Other Engineers (n = 849)	\$73,205 (5)	\$69,215 (6)	\$81,729 (4)	\$88,065 (2)	\$86,227 (3)	\$95,125 (1)
Architectural & Engineering Managers (n = 838)	\$94,556 (4)	\$93,765 (5)	\$104,780 (3)	\$109,989 (2)	\$89,131 (6)	\$127,474 (1)
Electrical Engineers (n = 658)	\$73,004 (5)	\$74,437 (4)	\$70,988 (6)	\$75,954 (3)	\$82,278 (2)	\$88,160 (1)

\* Based on students completing an engineering program (CIP codes 14 and 15) from an educational institution in Kentucky.

† The number in parentheses after the occupation name represents the number of engineering alumni from Kentucky institutions in the U.S.

‡ The number in parentheses after the annual wage represents the rank of the state from high to low wages across the occupation.

Source: Emsi Profile Analytics and Employees & Self-Employed 2019.4.

Wages for Kentucky engineers have for the most become more competitive compared to other states over the past 10 years. Specifically, wages are now more competitive for all of the above-listed engineering occupations except for architectural & engineering managers, which dropped from a rank of four to a rank of six.



# PROGRAM DEMAND GAP ANALYSIS

## Summary

- Kentucky's overall job growth is projected to be slower than the U.S. over the next decade (15% and 23%, respectively), however Kentucky engineering jobs are growing slightly faster than engineering jobs in the U.S. (28% compared to 27%).
- Kentucky's wages are fairly competitive to the states where engineering alumni are migrating. More Kentucky engineering alumni stay in the state (54%), compared to the portion of engineering alumni in the U.S. staying in their state (43%).
- Population growth in Kentucky is projected to be slower than the U.S. over the next 10 years (6% and 11%, respectively). Attainment levels in Kentucky remain lower than the national average.
- Statewide unemployment in Manufacturing is high comparable to the U.S., but the industry encompasses a variety of unskilled jobs, as well as engineering jobs that typically require bachelor's and graduate degrees and face low levels of unemployment .



# PROGRAM DEMAND GAP ANALYSIS

## Summary

- **Bachelor's+** The Manufacturing Engineering Technology program is area of expansion at the bachelor's degree level and above, driven by the industrial engineer occupation . Related programs such as mechanical engineering may also fill the industrial engineer occupation need. Other programmatic areas of opportunity are civil engineering and computer engineering, especially in the Kentuckiana LWA.
- **KCTCS** While the Quality Control & Safety Technologies/Technicians, program looks to be an area of expansion at the certificate and associate degree levels, demand is driven by an occupation not directly related to engineering or requiring high levels of postsecondary education .



# PROGRAM DEMAND GAP ANALYSIS

Table 2: Kentucky Program Recommendations

<p><b>HIGH DEMAND, LOW SUPPLY</b></p> <p><i>How can we expand these program opportunities?</i></p> <p>Manufacturing Engineering Technology (BACH+) Quality Control &amp; Safety (CERT+) Engineering Technology (BACH+)</p>	<p><b>HIGH DEMAND, HIGH SUPPLY</b></p> <p><i>How can we maintain focus on program quality &amp; student success?</i></p> <p>Civil Engineering (BACH+) Drafting &amp; Design (CERT+) Electrical &amp; Electronics Engineering (BACH+) Industrial Engineering (BACH+) Manufacturing Engineering Technology (CERT+)</p>
<p><b>LOW DEMAND, LOW SUPPLY</b></p> <p><i>Should we discontinue these programs?</i></p> <p>Electrical, Electronic &amp; Communications Engineering (CERT+) Plastics &amp; Polymer Engineering (CERT+) Mechatronics, Robotics, &amp; Automation Engineering (CERT+) Quality Control (BACH+) Computer Engineering Technology (BACH+) Drafting/Design Engineering (BACH+)</p>	<p><b>LOW DEMAND, HIGH SUPPLY</b></p> <p><i>Can we consolidate or reduce enrollment in these programs?</i></p> <p>Chemical Engineering (BACH+) Electrical &amp; Electronic Engineering (CERT+) Mining Technology (CERT+) Electromechanical &amp; Instrumentation (CERT+) Mechanical Engineering (BACH+)</p>

Source: Emsi program demand gap model.

# Questions for the panel...



#KyHigherEdMatters

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