

Annual Report 2015–2016

FROM THE CHAIR



2015–2016 was another strong year for the department. Both undergraduate and graduate enrollment finally leveled off after several years of exceptional growth. Still, we are the 50th largest undergraduate mechanical engineering program in the country. At the University of Dayton, more than one in 10 students study mechanical engineering.

Our co-op program placed 142 undergraduate students with world-class companies. This enables them to learn how to succeed in a professional engineering environment while they are mastering engineering fundamentals and being inspired to innovate in their classes. We also developed a graduate co-op program and placed five renewable and clean energy (RCL) students with energy efficiency and renewable energy firms. 98 percent of our graduates found full-time employment or enrolled in graduate school within six months after graduation.

Our faculty continued to excel in teaching, scholarship and service. Two faculty were named as associate editors of major research journals. The Industrial Assessment Center won the U.S. Department of Energy Center of Excellence Award for the second time. The faculty published 48 peer-reviewed papers and conducted over \$1.3 million in sponsored research. The faculty also helped us prepare for our fall 2016 ABET accreditation review.

Moreover, we were busy conducting searches for new faculty. In fall 2015, we re-hired Andrew Chiasson as an assistant professor, and he immediately made strong contributions to our energy courses and research. In fall 2016, we plan to welcome Robert Lowe, Tim Reissman and Sid Gunasekaran as assistant professors and Megan Reissman as a visiting professor.

The school-wide strategic plan is beginning its implementation phase. Plans include updates within Kettering Labs that would strengthen our laboratory and teaching capabilities. The Department of Mechanical and Aerospace Engineering remains committed to learning, leadership and service. Please continue to follow our progress at: https://www.udayton.edu/engineering/departments/mechanical_and_aerospace/index.php

Sincerely,

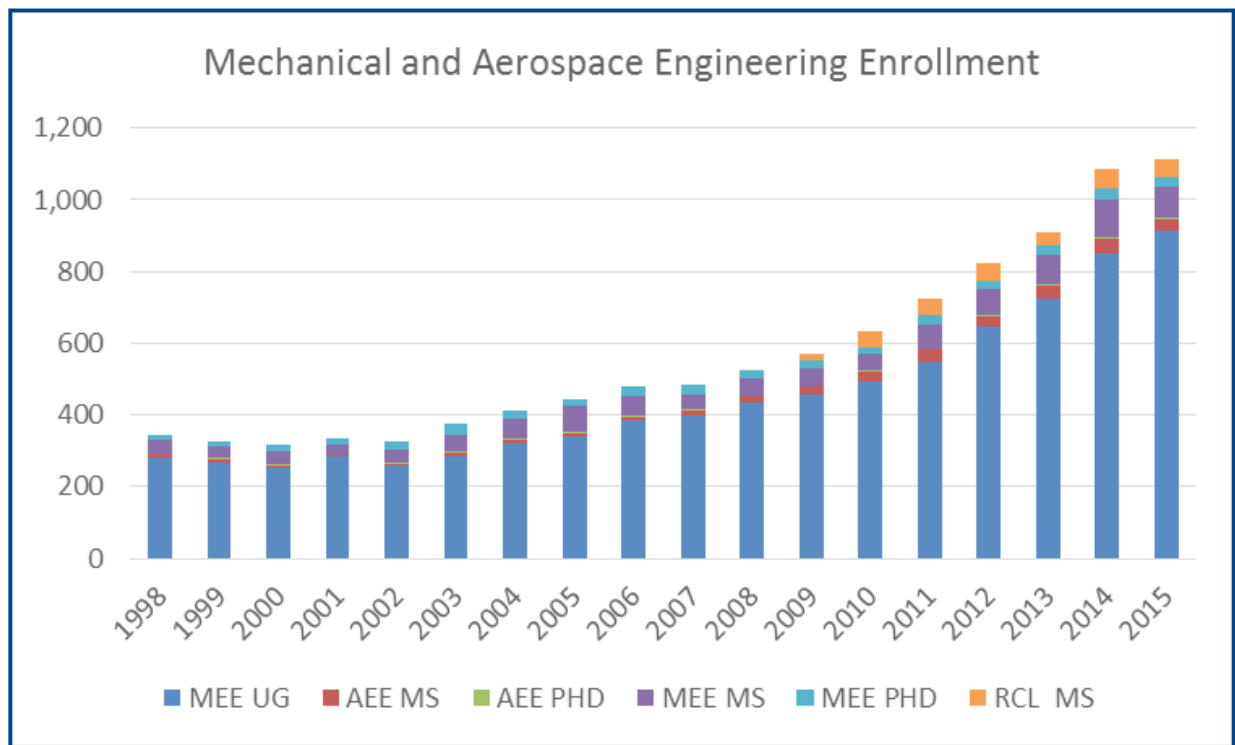


J. Kelly Kissock, Ph.D., P.E.

Chair, Department of Mechanical and Aerospace Engineering / Renewable and Clean Energy

ENROLLMENT AND GRADUATION DATA

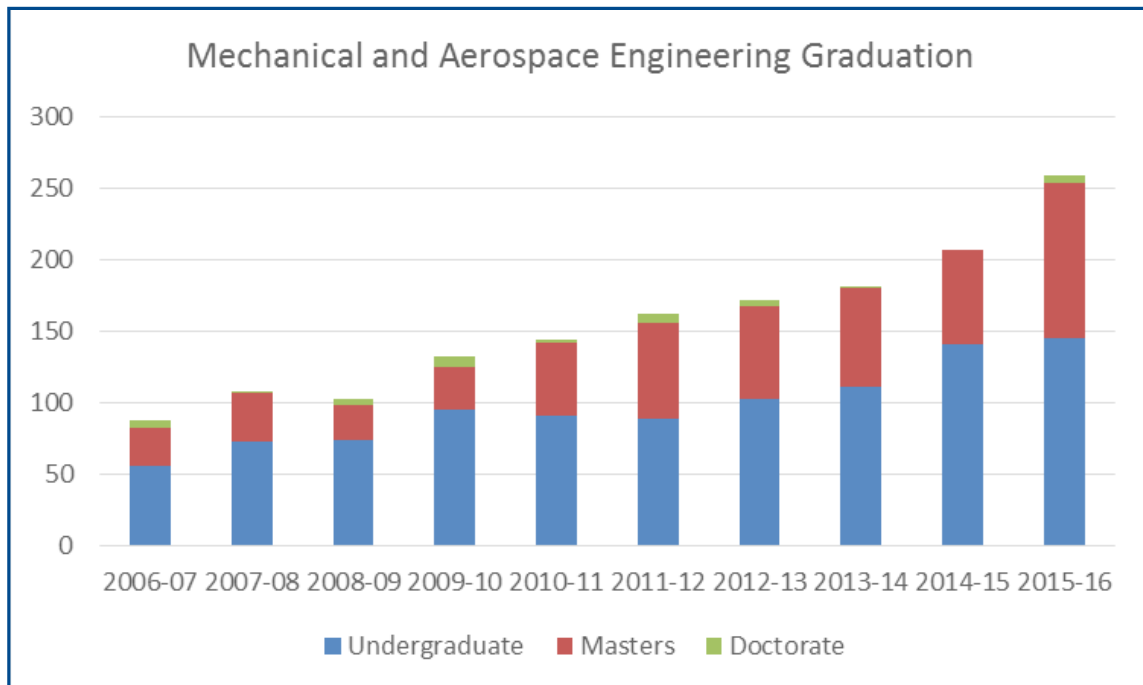
Over the last few years, enrollment in the Department of Mechanical and Aerospace Engineering has increased significantly. Since 2010, undergraduate enrollment increased 85 percent compared to 31 percent in the School of Engineering, 12 percent in the University of Dayton, and 38 percent in mechanical engineering nationwide. We are the single largest department in the University of Dayton and one of the few that offers bachelor's, master's and doctoral degrees. Our department accounts for over 10 percent of all enrollment at UD.



Enrollment by Department of Mechanical and Aerospace Engineering program is shown below:

	2010	2011	2012	2013	2014	2015
BS ME	493	546	648	725	852	916
MS AE	28	36	27	36	39	29
PHD AE	4	4	4	3	5	6
MS ME	46	66	74	81	106	84
PHD ME	16	27	23	26	31	29
MS RCL	45	45	48	37	53	51
TOTAL	632	724	824	908	1086	1115

The number of students graduating has increased with enrollment. In 2014–2015, we granted 145 bachelor's degrees, 109 master's degrees and five doctoral degrees. The program graduation rate is very high; a detailed study of the 2006–2009 cohorts showed that 66 percent of undergraduate students who enrolled in mechanical engineering graduated with a bachelor's degree from the University, and 14 percent graduated with another UD degree. 97 percent of our mechanical engineering students graduated in nine semesters or less. We are the 50th largest undergraduate Mechanical Engineering program in the country based on the number of students graduating (ASEE Engineering by the Numbers: 2014–2015).



FALL 2015 FIRST-YEAR CLASS

In fall 2015, 167 first-year students enrolled in our department. Statistics from the entering class are shown below.

2015 MEE First-year Class	
Students	167
From U.S.	160
Female	31
With honors	74
Average ACT	28.1
Average GPA	3.86
Average high school rank	82%

STUDENT ACHIEVEMENT

Congratulations:

- Vijay Krishna Jayaprakash won the Society of Asian Scientists and Engineers (SASE) 2015 SASE Collegiate Star Award (Midwest Region) for founding the UD SASE Chapter and impressively contributing to SASE.
- Football players Brett Bass, Chris Beaschler, Jimmy Vogel and Tucker (William) Yinger were selected as Academic All-District team members.
- Suzanne Dorsey was named an Epicenter University Innovation Fellow to develop entrepreneurial skills.
- Graduate student, Manjhunath Ayyampudur, won the 2016 Koehler International Student Award.
- Nicolas Carducci, MEE sophomore, finished first and Manjhunath Ayyampudur and Chris Wagner, RCL students, finished second, in the E-Week Supermarket of the Future Innovation Challenge.
- Second year students, Stephen (Steve) McFadden and Kayla Pariser, were selected to participate in the University Honors Program Berry Summer Thesis Institute.
- James Tancred won the Best Technical Presentation in Hypersonics Award for “Aerodynamic Database Generation for a Hypersonic Vehicle using Variable-Fidelity Kriging and Control Elevon Deflection as an Independent Variable,” and Tim Vincent won the Best Technical Presentation in CFD Applications Award for “A Simulation Tool for Aiding Qualification of Additively Manufactured Parts” at the 41st AIAA Dayton Cincinnati Aerospace Science Symposium (DCASS) 2016. Both students work under the guidance of Dr. Markus Rumpfkeil.
- Ahmed Tukur, Sid Gunasekaran and Rodwan Elhashmi were selected to present their research work at the first Annual Research Colloquium (ARC) organized by the School of Engineering, University of Dayton, April 19–21, 2016.
- Qi Guo won the School of Engineering Graduate Teaching Assistant Award; Dan Kelley won the Mechanical and Aerospace Engineering Master’s Student Research Award for his work with Dr. Jun- Ki Choi; Sid Gunasekaran won the Aerospace Engineering Doctoral Student Research Award for his work with Dr. Aaron Altman; Bingjue Li won the Mechanical Engineering Doctoral Student Research Award for her work with Drs. Drew Murray and Dave Myszka on April 20, 2016.
- Ryan Shea won a Fulbright scholarship to study the cost effectiveness of solar with battery storage on the island of Mauritius from August 2016 to May 2017.
- Dillon Stenger won a Dayton Area Graduate Studies Institute fellowship to work with Dr. Aaron Altman on ignition of scramjet engines.
- RCL students Matt Worsham and Oliver Winter and the UD ETHOS team won multiple awards for their U.S. Environmental Protection Agency-sponsored ‘People, Prosperity and Planet’ project: Solar Thermal Adsorption Refrigerator (STAR) at the USA Science and Engineering Festival in Washington, D.C., April 16–17, 2016. The work was conducted under the direction of Prof. Amy Ciric and Dr. Jun-Ki Choi and built upon previous work by RCL students Gretchen Berkemeier, Chris Denzinger and other MEE and

ETHOS students. Thirty-eight EPA P3 Phase-1 award-winning teams presented at the competition. The UD STAR team proudly won 3 of the 5 awards:

- ▶ Sustainable Development Award presented by American Society of Civil Engineering
 - ▶ Sustainable Energy Award presented by Mid-Atlantic Solar Energy Society
 - ▶ The Vitruvius Award presented by organic ARCHITECT
- Supermileage team, Dan Sager, Matt Farkosh, Eric McGill, Darly Osterloh and Ryan Hoyt, entered their car in two 2016 driving competitions: the Shell Eco-Marathon—Americas in Detroit, Michigan and the Society of Automotive Engineers Supermileage Competition in Marshall, Michigan, achieving 265 miles per gallon.
 - Christopher Beachler (football) and Hunter Johnston (cross country) were named Academic All-Americans for 2015–2016.



CO-OP

142 mechanical engineering and five renewable and clean energy students participated in co-op. 84 percent of the placements were in Ohio. Major co-op employers are shown below.

Employed the Most Co-ops

- ▶ Emerson Climate Technologies, Inc.
- ▶ GE Aviation
- ▶ Johnson & Johnson
- ▶ Parker Hannifin Corporation
- ▶ GE Appliances & Lighting
- ▶ Melink Corporation
- ▶ Tenneco
- ▶ Cornerstone Research Group, Inc.
- ▶ Cummins, Inc.
- ▶ DRT Holdings, Inc.
- ▶ IAP Research, Inc
- ▶ ITW Food Equipment Group

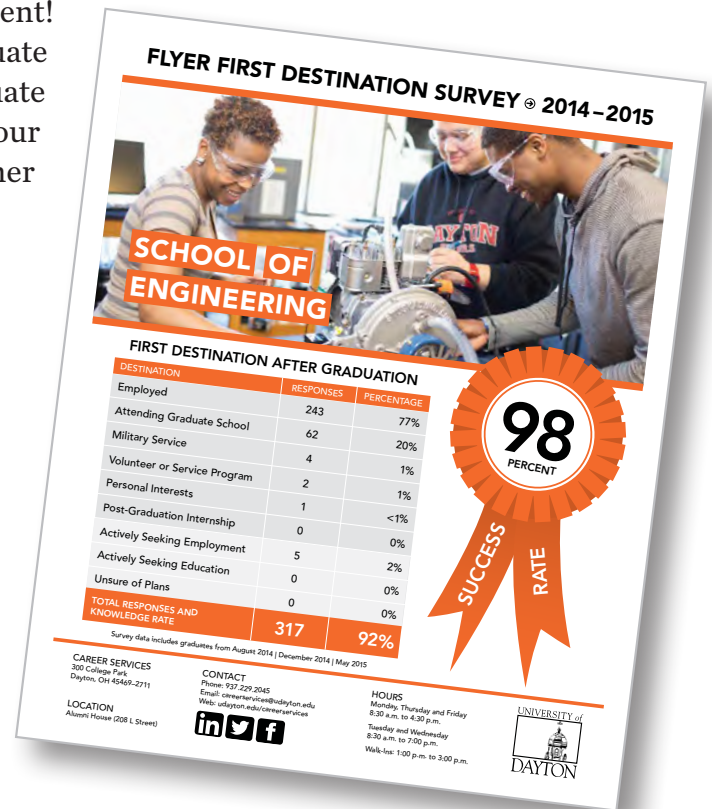
Other Significant Co-op Employers

- ▶ BMW Manufacturing Co., LLC
- ▶ Cargill, Inc.
- ▶ Ford Motor Company
- ▶ Honda Engineering North America, Inc.
- ▶ Yaskawa Motoman Robotics
- ▶ Tesla Motors, Inc.
- ▶ The Dannon Company
- ▶ The J.M. Smucker Company
- ▶ Siemens Industry, Inc.
- ▶ NASA Johnson Space Center
- ▶ Plug Smart
- ▶ Cook Medical, Inc.

FLYER FIRST DESTINATION 2014–2015

The success rate for recent graduates increased to 98 percent! Six months after graduation, 78 percent of our undergraduate students had full-time jobs and 20 percent went to graduate school. The average salary was \$58,976. In addition to our co-op sponsors who regularly hire our graduates, other employers include:

- ▶ AIDA-America
- ▶ Boeing
- ▶ Crown Equipment Corporation
- ▶ Eaton Corporation
- ▶ Fujitec America
- ▶ Lockheed Martin
- ▶ Lubrizo
- ▶ Marathon Petroleum
- ▶ Mitsubishi Electric Power Products
- ▶ Rolls-Royce
- ▶ Toyota Industrial Equipment Manufacturing, Inc.
- ▶ United Technologies Corporation



ALUMNI ACHIEVEMENT



The Honda Civic won the North America Car of the Year Award in part because of the leadership of mechanical engineering alumnus Bridget Hamblin, who led the Honda Civic dynamics team responsible for the car's steering, ride, handling and stability.



Alumnus Steve Mulqueen (BME, MSME) won the 2016 U.S. Department of Energy IAC Alumni Award.

FACULTY AND STAFF LISTING

The department has 18 full-time faculty members and four staff members

	FULL-TIME FACULTY	POSITION	EXPERTISE
1	Henrick, Andrew	Lecturer	Thermal/fluids
2	Perkins, Dave	Lecturer	Mechanical systems
3	Kinney, Allison	Assistant Professor	Biomechanics
4	Heyne, Josh	Assistant Professor	Combustion
5	Choi, Jun-ki	Assistant Professor	Design for environment
6	Chiasson, Andrew	Assistant Professor	Energy
7	Rumpfkeil, Markus	Assistant Professor	Computational fluid dynamics
8	Bigelow, Kimberly	Assistant Professor	Biomechanics
9	Petrykowski, John	Assistant Professor	Thermal/fluids
10	Pinnell, Margaret	Assistant Professor	Materials
11	Myszka, Dave	Assistant Professor	Mechanical systems
12	Altman, Aaron	Professor	Aerospace
13	Hallinan, Kevin	Professor	Thermal/fluids
14	Ervin, Jamie S.	Professor	Energy
15	Jain, Vinod K.	Professor	Mechanical systems
16	Kashani, Ahmad	Professor	Dynamic systems and controls
17	Kissock, Kelly	Professor and Chair	Energy
18	Murray, Andrew	Professor	Mechanical systems
	STAFF	POSITION	
1	Stuck, Ginger	Administration	
2	Alexander, Sherri	Budgeting and purchasing	
3	Boehle, Matt	Lab Manager	
4	Collins, Larry	Flight Simulation Tech	

ADDITIONS AND SUBTRACTIONS



Andrew Chiasson



Matt Boehle

Dr. Andrew Chiasson re-joined the department as an assistant professor. Andrew is an expert in ground-source heat pumps and solar energy. Matt Boehle joined the department as lab manager. Matt holds B.S. and M.S. degrees from our program and also works at UDRI. Michelle Strunks left to become manager of student success for the School of Engineering and Judi Butts left to become an academic adviser for the School of Engineering.



FACULTY ACHIEVEMENT

Congratulations:

- Kim Bigelow was named associate editor for the *Journal of Applied Biomechanics* and executive board member for the American Society of Biomechanics.
- Drew Murray, as this year's MEE STAR, presented "Complexity for Simplicity: The Elegance of Variable Geometry Engineering" at the University of Dayton Spotlight on Technology, Arts, Research and Scholarship (STARS) Symposium, September 17, 2015.
- Jun-Ki Choi delivered an invited lecture at the 2015 International Forum on Sustainable Manufacturing on September 24, 2015.
- Andrew Chiasson was named associate editor for *Geothermics—an International Elsevier Journal*.
- The University of Dayton Industrial Assessment Center won the U.S. Department of Energy 2015 Center of Excellence Award.

FACULTY SCHOLARSHIP

The faculty published 17 archival journal articles and book chapters and 31 peer-reviewed conference articles. They delivered 14 invited lectures. 2015 faculty research expenditures increased by about 30 percent from last year to \$1,375,406. Research sponsors include:

- ▶ American Society of Bio
- ▶ Chrysler Corporation
- ▶ City of Dayton
- ▶ Dayton Power & Light
- ▶ Emerson Climate Technologies
- ▶ Evenflo Company
- ▶ Flairsoft Limited, LLC
- ▶ Goodwill Easter Seals
- ▶ Gosiger, Inc
- ▶ Ideation Techniques
- ▶ Initial Transient Simulation
- ▶ Innovative Scientific Solutions
- ▶ Kern Family Foundation
- ▶ Kettering Health Network
- ▶ National Science Foundation
- ▶ Oak Ridge Institute for Science and Education
- ▶ State of Ohio Dept. of Developmental Disabilities
- ▶ Surrogate Models/Comp Design
- ▶ The University of Tennessee
- ▶ Universal Technology Corporation
- ▶ University of Dayton Research Institute
- ▶ U.S. Department Of Energy
- ▶ U.S. Environmental Protection
- ▶ U.S. Federal Aviation Administration
- ▶ Vectren Energy Delivery
- ▶ VEGA Americas Inc

CURRICULUM UPDATE

New Minor in Biomechanical Engineering

To meet the growing interest from our students in biomechanics, we instituted a new minor in human movement biomechanics, and two new classes to support the minor:

- MEE 230 Introduction to Biomechanics
- MEE 450/531 Experimental Methods in Biomechanics

Improved Seminars

We overhauled our first-year, sophomore, junior and senior seminars to have more defined student outcomes, support our academic and co-op advising efforts, and support our mission and objectives. The primary emphasis of each seminar is shown below:

- First-year: university experience and advising
- Sophomore: mechanical engineering curriculum options and co-op
- Junior: professional mechanical engineering experience
- Senior: life skills, lifelong learning, leadership and service

Entrepreneurial Engineering

Currently, 11 Department of Mechanical and Aerospace Engineering faculty are engaged as Kern Entrepreneurial Engineering Network (KEEN) fellows. This commitment to innovative teaching is evident in the plethora of advanced teaching pedagogies employed by our faculty including portfolio-based learning (MEE 225, MEE 425), project-based learning (MEE 434, MEE 460), and flipped classrooms (MEE 420).



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