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# **AC 2012-2943: A SURVEY OF DISTANCE LEARNING PROGRAMS THAT OFFER A MASTER'S OF SCIENCE IN MECHANICAL ENGINEERING DEGREE**

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# **A Survey of Distance Learning Programs that offer a Master of Science in Mechanical Engineering Degree**

## **Abstract**

This paper surveys fourteen distance learning programs offering the master of science in mechanical engineering degree in the United States. The results of this study look at the approximate length of time these programs have been in existence. The equivalency of the distance learning degree and the on-campus degree are examined with regard to admission standards, opportunities to conduct thesis research, and the approximate number of courses offered each year via distance education delivery. Approximate costs of the distance learning course work per credit hour is also noted and the approximate enrollments in these online programs are cited for the fall of 2010. The data collected in this study provides a single comprehensive source of distance education programs in the United States that offer the master of science degree in mechanical engineering.

## **Background**

Distance learning programs are growing rapidly. In his article, "Online Distance Education in the United States," Dale Harris cites three primary reasons for this significant increase. The first reason is the increased demand for higher education. In addition, the technology to meet this demand through distance education is here now and will only improve over time. This availability of enabling technology is Harris' second reason for the growth in distance learning programs. The third reason Harris cites is the business opportunity for financial success in the distance education market.<sup>1</sup>

With regard to the mechanical engineering discipline, to the author's knowledge there are no current fully distance learning programs that offer an ABET-accredited bachelor level degree in mechanical engineering. Some programs offer a portion of their course work and undergraduate degree requirements via distance learning modes of delivery. The primary difficulty with the full undergraduate bachelor degree in mechanical engineering offered completely online is the inability to adequately fulfill the ABET criteria associated with laboratory and experimental requirements.

Contrary to the lack of mechanical engineering degrees offered at the undergraduate level via distance learning, the number of distance master level mechanical engineering degrees offered has experienced the same sort of growth cited by Harris above for the distance education environment in general.

## **Purpose of this Study**

One of the challenges in learning more about the distance education programs in mechanical engineering at the graduate level is the lack of a single comprehensive source that lists all of the programs. The purpose of this paper is to fill that gap and survey the distance education programs that offer a master of science in mechanical engineering degree.

## Conduct of the Survey

To assemble the data for this survey, an online search was conducted to find distance learning programs that offer the master of science in mechanical engineering degree. A primary source was “The U.S. News & World Report Online Education Search” that lists schools with online engineering programs.<sup>2</sup> It is believed that all schools with distance learning masters of science degree in mechanical engineering programs, as of the fall of 2010, have been identified in this paper. If this is not the case, the author apologizes to any program that was inadvertently omitted and asks that they contact the author with information regarding their program. Table 1 is a list of the programs surveyed in this study.

Columbia University
Georgia Institute of Technology
Kansas State University
Lehigh University
Michigan Tech
Missouri University of Science and Technology
North Carolina State University
Purdue University
Stanford University
University of Florida
University of Illinois at Urbana-Champaign
University of Texas at Arlington
University of Wisconsin - Madison
Worcester Polytechnic Institute

Table 1. Distance Learning Master of Science in Mechanical Engineering Programs

To collect the data reported in this paper, information was gathered from the program’s web site, email correspondence and/or telephone communications with officials of the respective schools.<sup>3-26</sup>

## Results of the Study

All of the programs that offer the distance learning master of science degree in mechanical engineering are highly reputable. All have ABET-accredited bachelor level degrees in mechanical engineering. Six of the fourteen schools were ranked in the top 25 of Best Engineering Schools as reported in 2010 by U.S. News and World Report.<sup>27</sup> Four of the schools were included in the top 10 of the 2010 U.S. News and World Report Best Engineering Schools in the Specialty Ranking of mechanical engineering.<sup>28</sup> Many of the distance learning programs have been in existence for a number of years. The Stanford University program was started in 1954. The University of Florida and Purdue University programs were started in the 1960s. A number of programs began in the 1970s and 1980s. Three of the programs started in the last decade; the Kansas State University, Lehigh University, and Worcester Polytechnic Institute distance learning programs in mechanical engineering were founded respectively in 2005, 2006, and 2010.

## Degree Equivalency

The exact same Master of Science in Mechanical Engineering degree is awarded to both on-campus and distance learning students for all programs included in this study. All of the programs also use the same admission standards for both on-campus and distance education applicants. All except three of the programs do not require on-campus attendance to complete the masters degree in mechanical engineering requirements. The University of Illinois at Urbana-Champaign and the University of Texas at Arlington require some on-campus attendance. Stanford University does not require any on-campus attendance, but many of their distance education students are part-time and do some of their studies on-campus. The distance learning program at the University of Wisconsin at Madison includes a 3 hour summer laboratory on-campus.

## Scope and Research Options

Table 2 is a list of the programs and the approximate number of mechanical engineering courses that are offered each year via distance learning. The modes of delivery for all of the programs studied included on-demand and download options. Table 2 also includes information whether distance learning students may pursue a thesis option in the completion of their master degree requirements.

	Approximate number of distance learning courses offered each year	Is thesis option available for distance learning students?
Columbia University	15-25	Yes
Georgia Institute of Technology	39	Yes
Kansas State University	10	No
Lehigh University	12	Yes
Michigan Tech	10-12	Yes
Missouri University of Science and Technology	19	Yes
North Carolina State University	20	No
Purdue University	15-20	Yes
Stanford University	Not Available	Yes
University of Florida	10-15	Yes
University of Illinois at Urbana-Champaign	10-12	Yes
University of Texas at Arlington	7	Yes
University of Wisconsin - Madison	10	Yes
Worcester Polytechnic Institute	6	No

Table 2. Distance learning courses offered and availability of thesis option

## Enrollment and Costs

Table 3 is a list of the approximate number of distance learning students enrolled during the fall 2010 term. An approximate cost of distance learning courses per credit hour is also included. For those programs that distinguish between resident and non-resident charges, the non-resident charges are listed.

	Approximate number of distance learning students enrolled in fall 2010	Approximate cost of distance learning courses per credit hour
Columbia University	18	\$1372/hr
Georgia Institute of Technology	203	\$1020/hr
Kansas State University	28	\$611/hr
Lehigh University	24	\$645/hr
Michigan Tech	20	\$633/hr
Missouri University of Science and Technology	23	\$798/hr
North Carolina State University	58	\$700/hr
Purdue University	106	\$940/hr
Stanford University	17	\$1310/hr
University of Florida	39	\$1179/hr
University of Illinois at Urbana-Champaign	27	\$889/hr
University of Texas at Arlington	45	\$1200/hr
University of Wisconsin - Madison	26	\$1571/hr
Worcester Polytechnic Institute	Not Available	\$1159/hr

Table 3. Approximate enrollment numbers and costs per credit hour

## Conclusions

The data collected in this paper confirms the significant size of distance learning programs in mechanical engineering at the master's degree level in the United States. All of the schools surveyed maintained the same admission standards and offer the exact same degree to the distance learning students as their on-campus peers. A large number of classes are available to distance education students and many schools allow students the option to pursue thesis research in completing their distance learning program. Significant enrollments are reported in the distance learning programs as of the fall of 2010.

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