

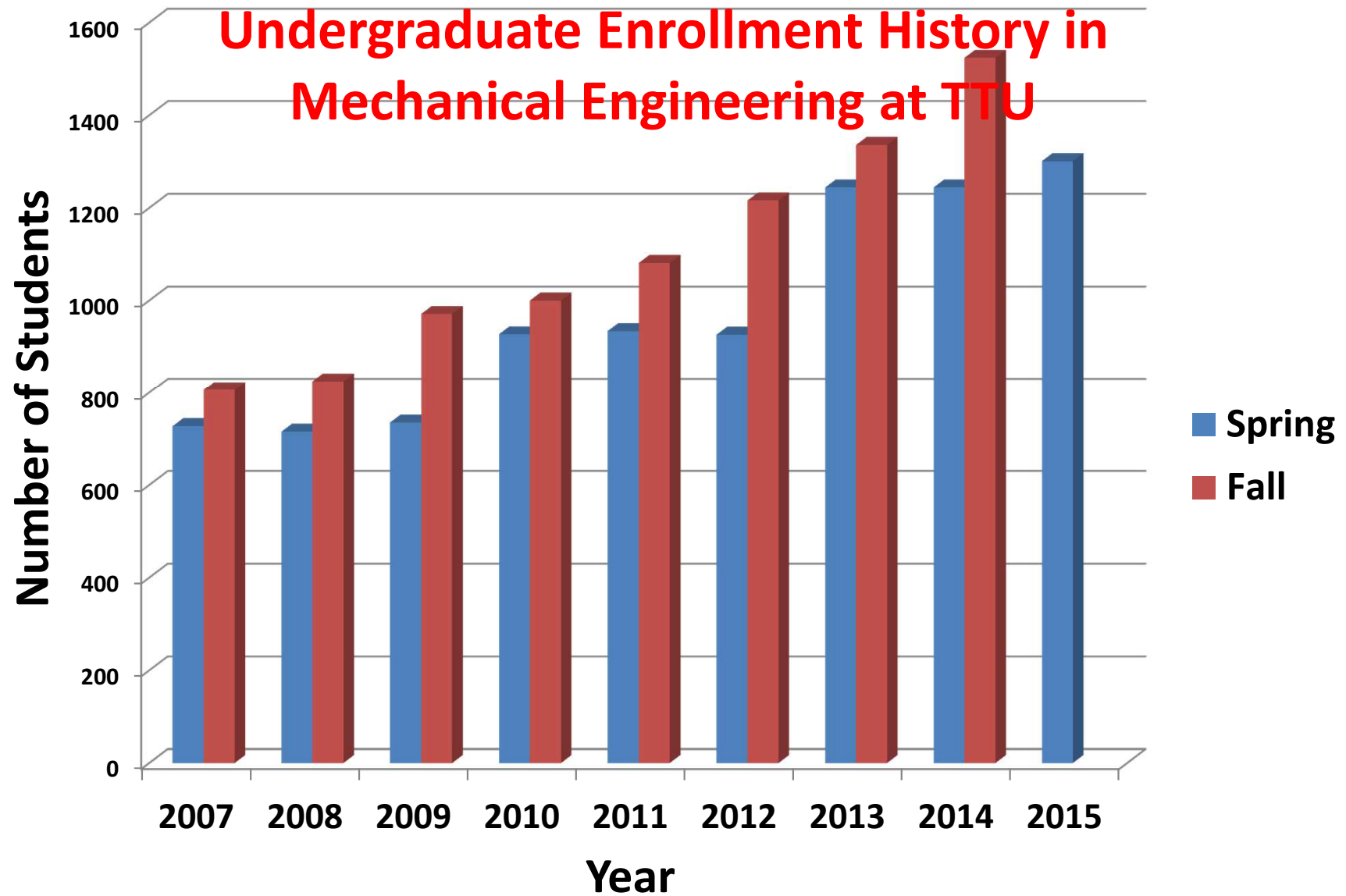


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College of Engineering

Department of Mechanical Engineering

**Dr. Jharna Chaudhuri**  
**Professor and Chair**  
**Department of Mechanical Engineering**  
**Texas Tech University**  
**Presentation to**  
**ME Industrial Advisory Board and ME Academy**  
**Members**  
**April, 2015**

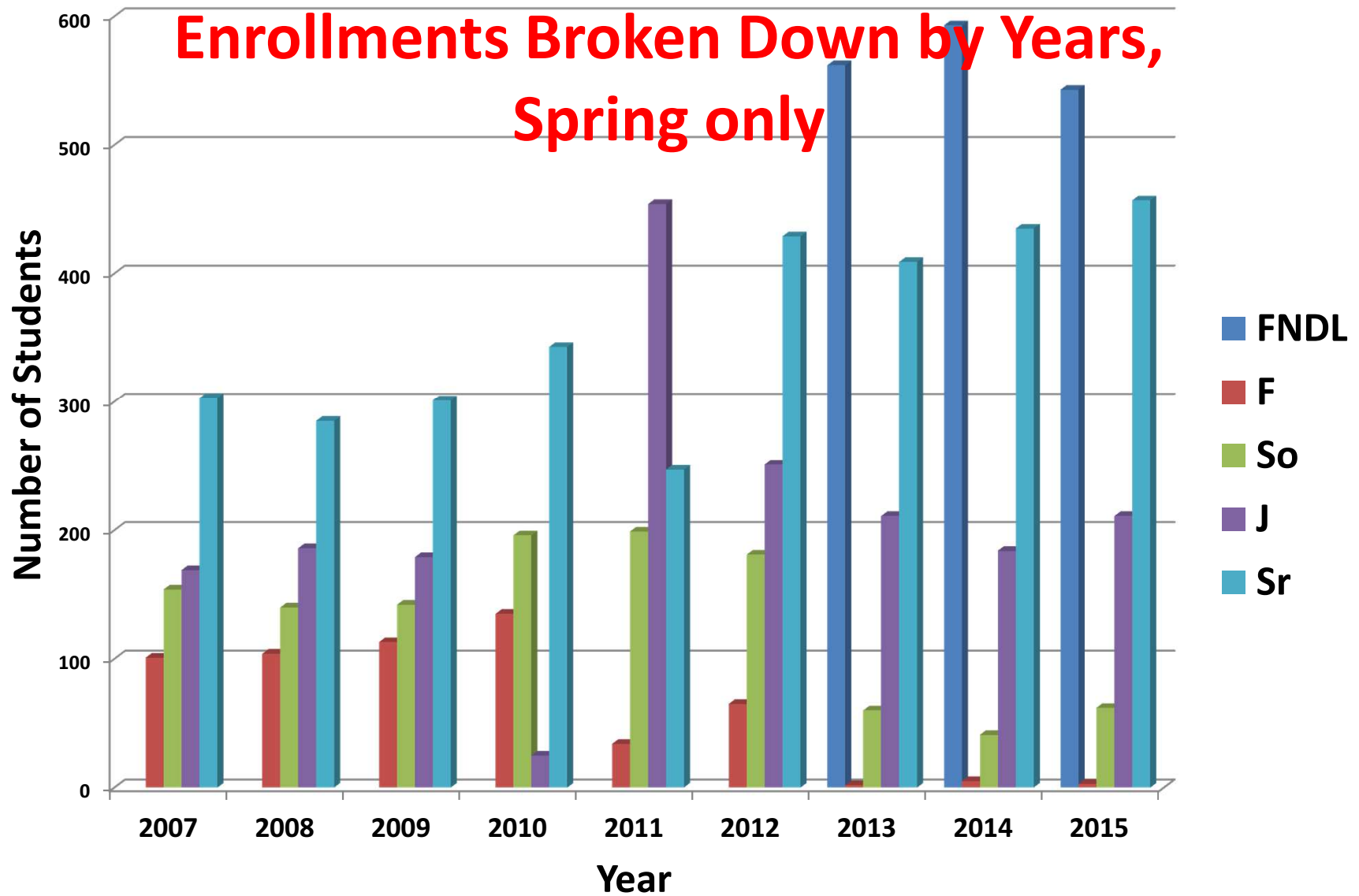




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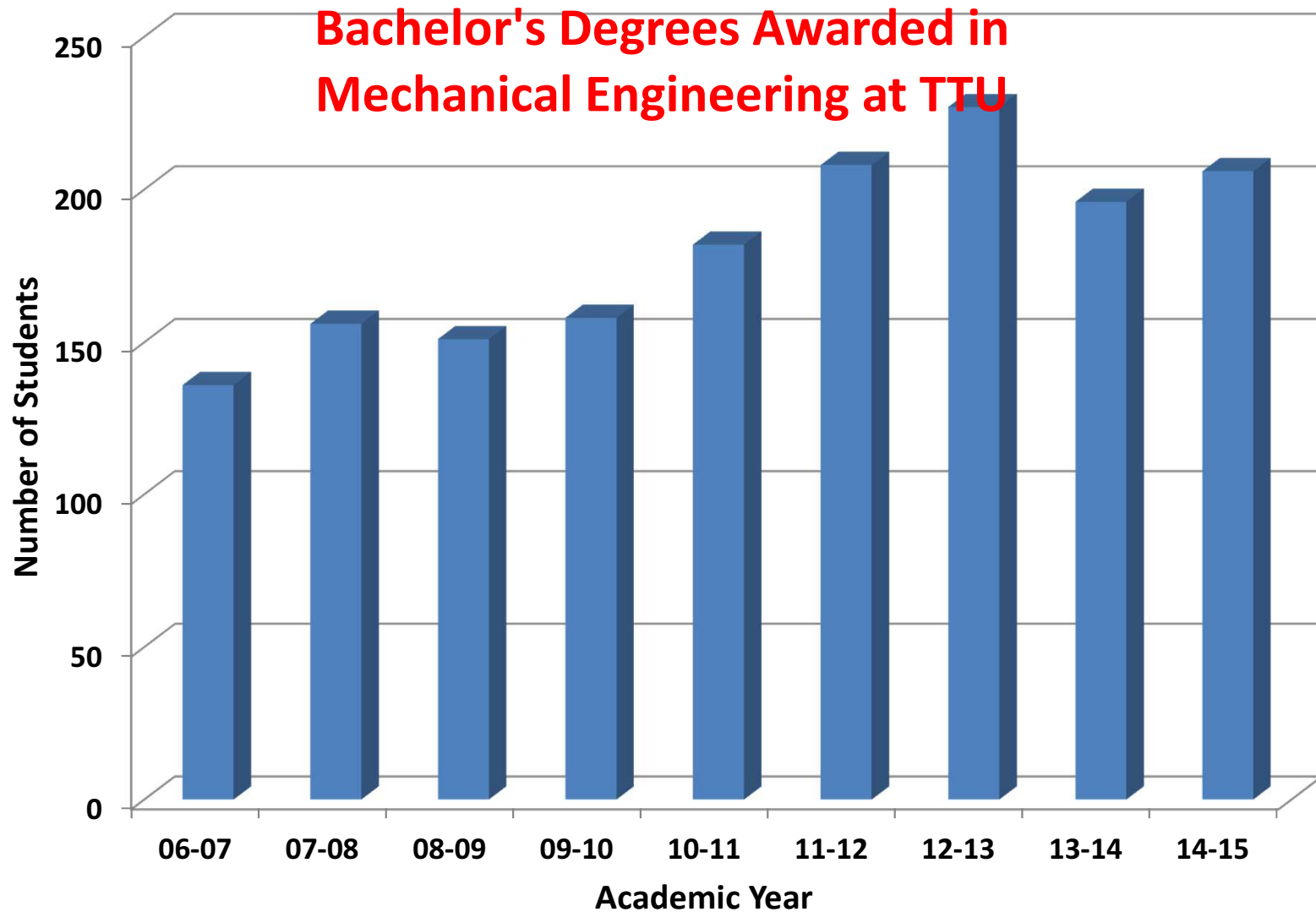




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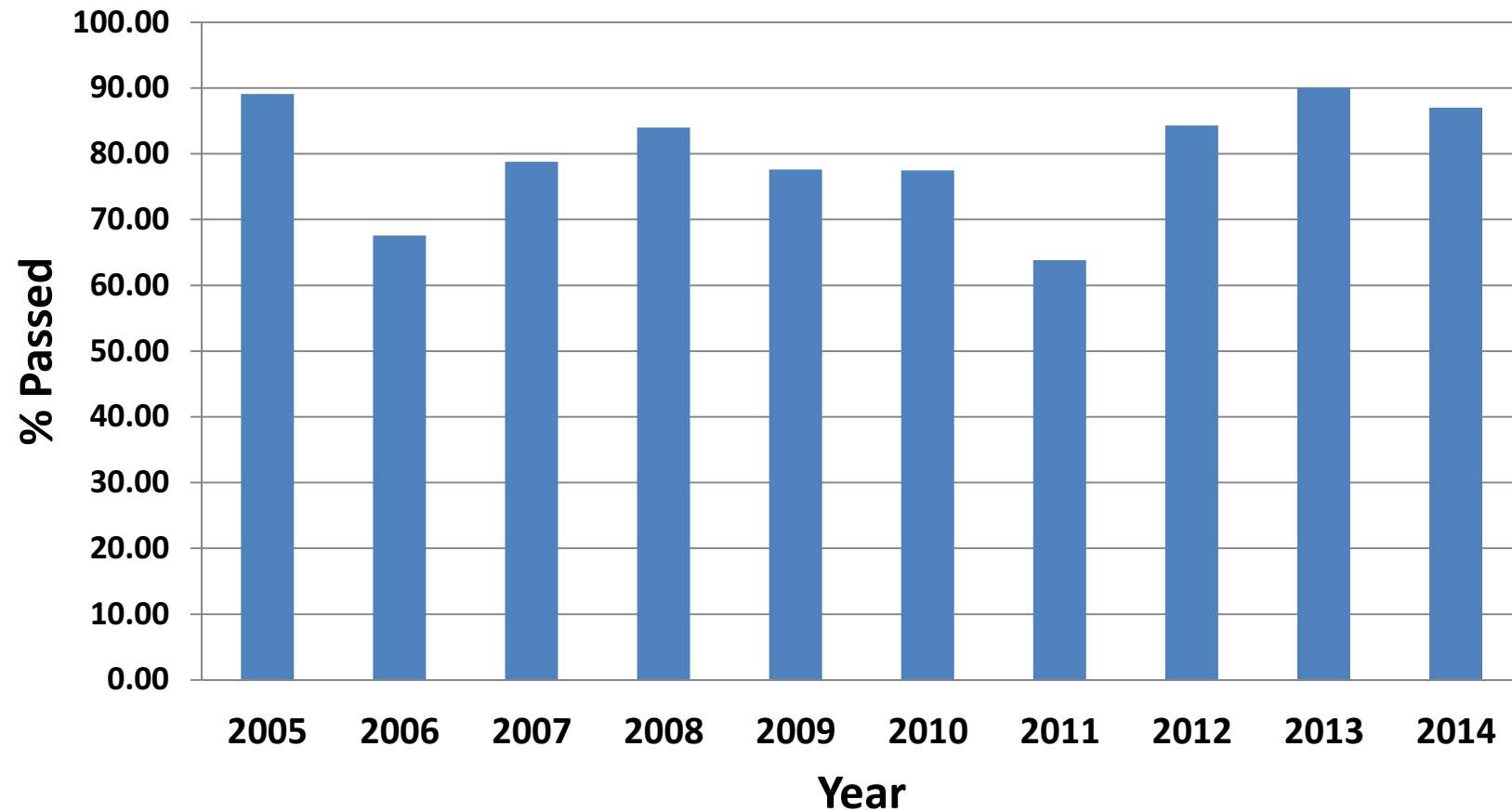


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## TTU Mechanical Engineering FE Exam Pass Rate

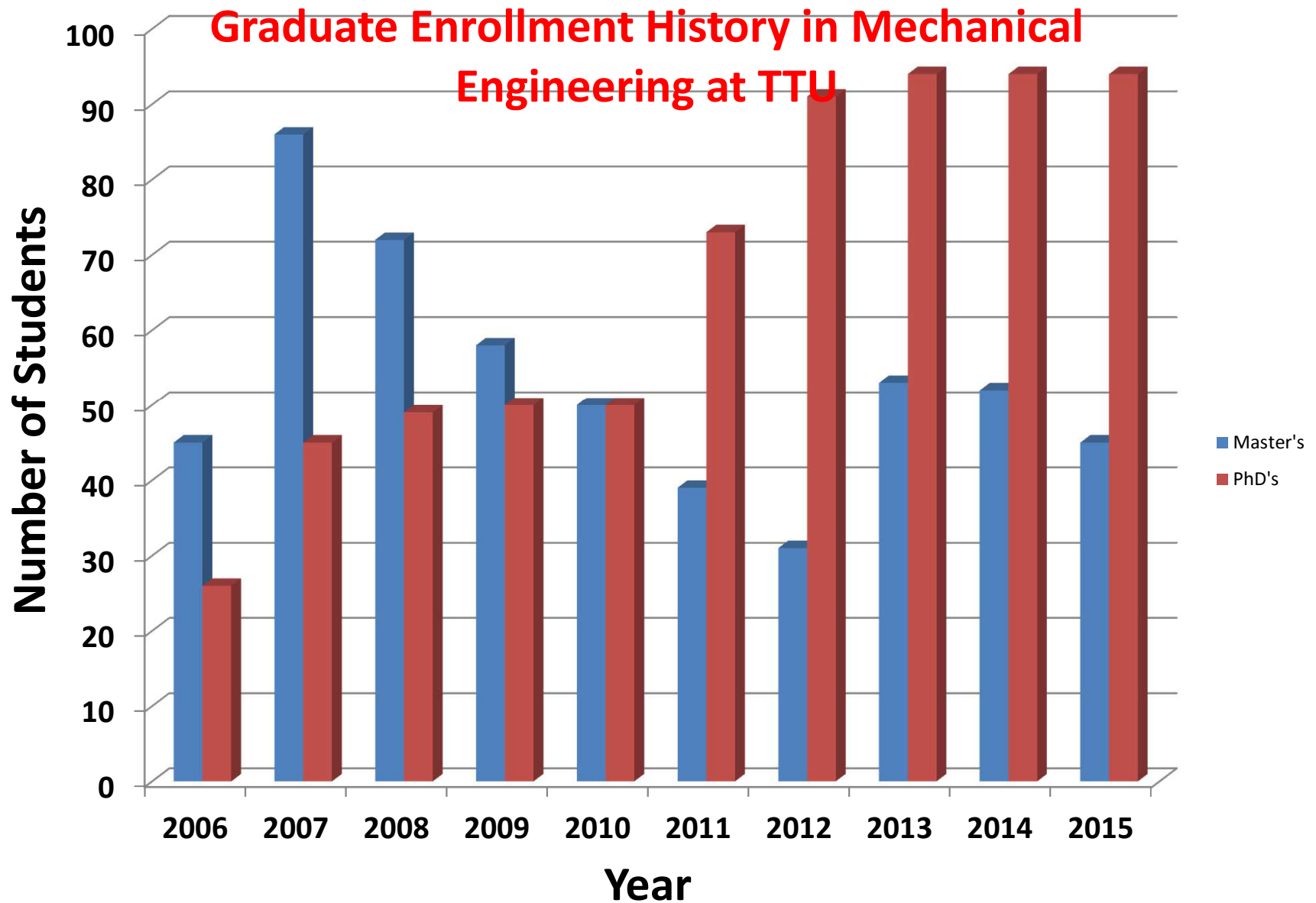




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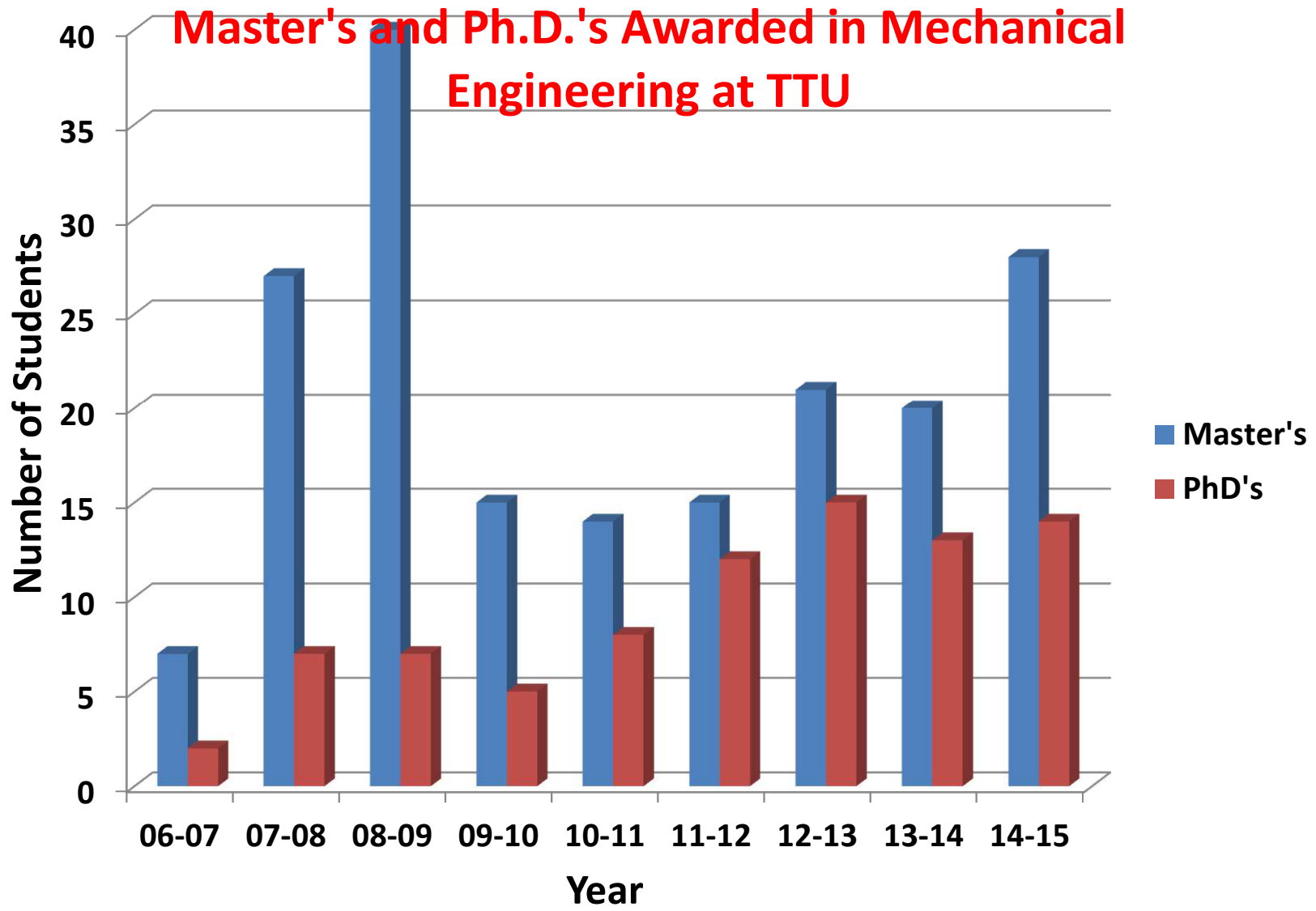




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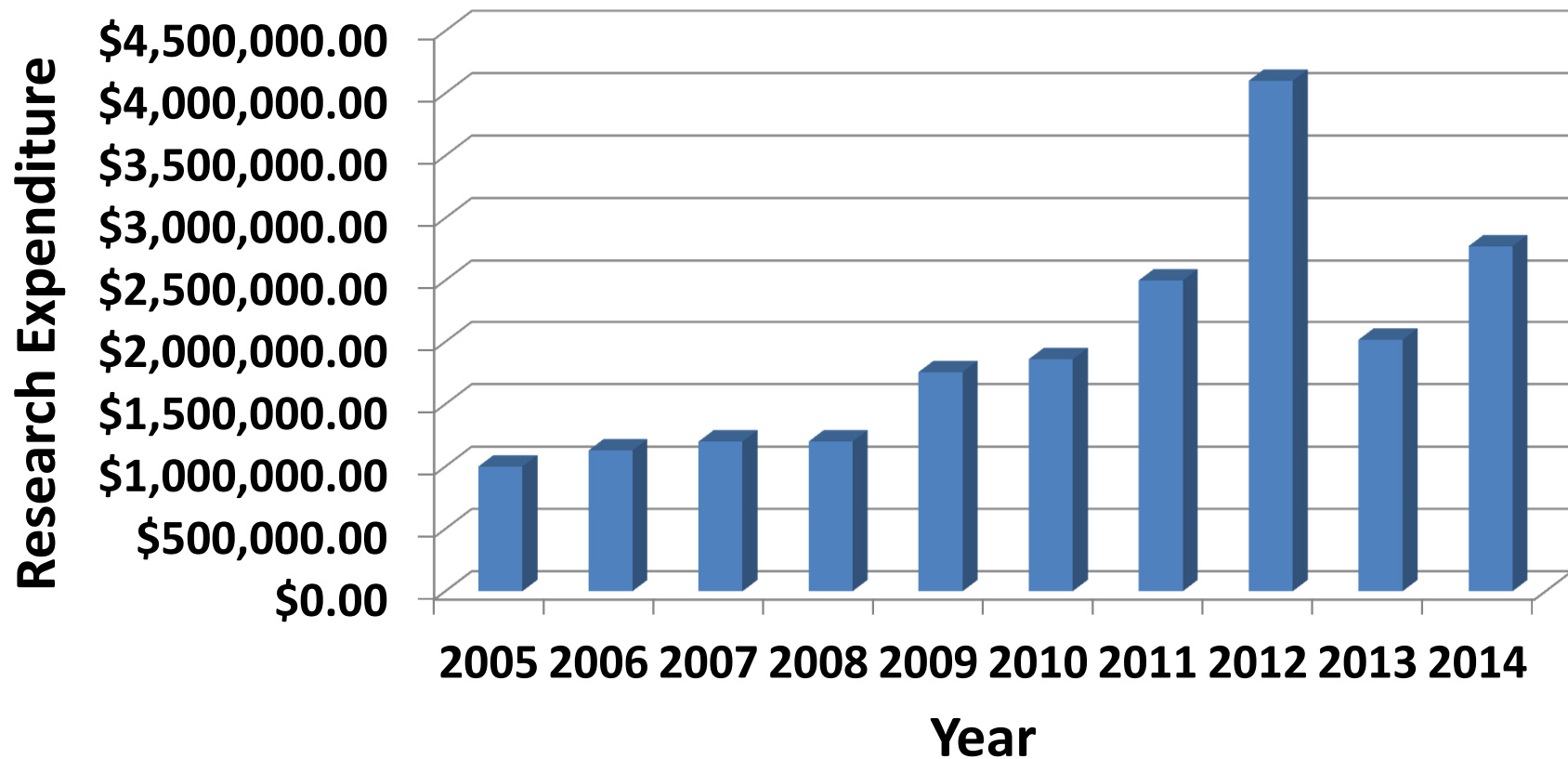
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# TTU Mechanical Engineering Sponsored Research

## Awards By Faculty Home Department





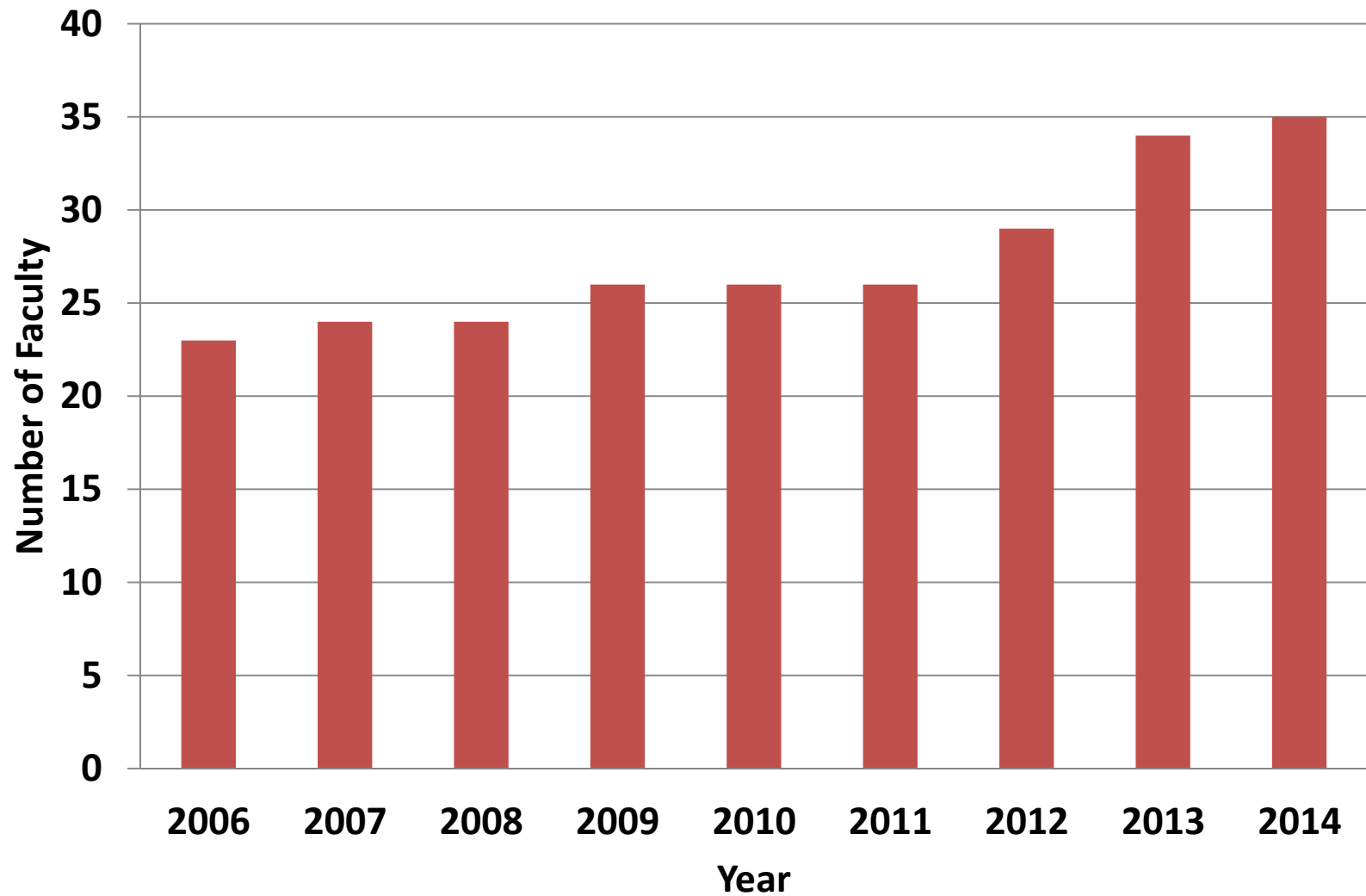


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## Mechanical Engineering Faculty, Tenure-Track

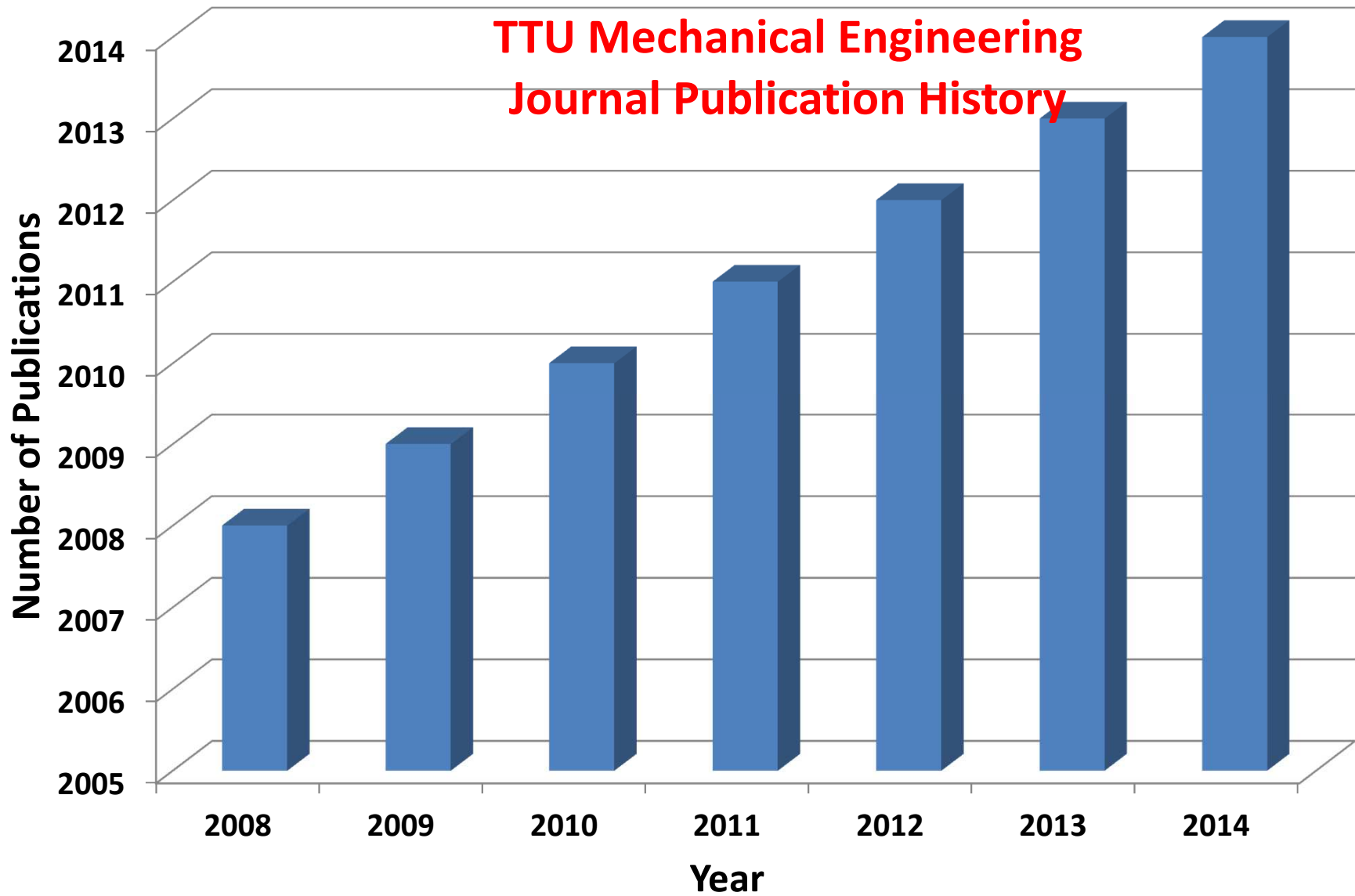




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# Student News



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# **ME Hosts ASME District E SPDC Second Year in a Row (April 9-11, 2015)**



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# Lewis Accepted to Common European Master's Course in Biomedical Engineering



**Kate Lewis, a senior mechanical engineering student, has been accepted into the Common European Master's Course in Biomedical Engineering (CEMACUBE). This consortium prepares students from Europe and outside Europe for professions in biomedical engineering through a European dual-master program. This year, 33 students from 16 countries were accepted. Lewis was one of three Americans who will participate.**



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# Engineering Students Named University Innovation Fellows

Three Texas Tech engineering students are among 123 students from 52 U.S. higher education institutions that have been named [University Innovation Fellows](#) by the National Center for Engineering Pathways to Innovation (Epicenter). [Valente Rodriguez](#), a senior mechanical engineering major, [Benjamin Simmons](#), a junior mechanical engineering major, and [Francis Atore](#), a senior chemical engineering major, join two other Texas Tech students in this distinct honor.

The [National Center for Engineering Pathways to Innovation \(Epicenter\)](#) is funded by the National Science Foundation and directed by Stanford University and VentureWell (formerly NCIIA).



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# Cloutier Receives NORA Young/New Investigators Symposium Travel Award



**Aimee Cloutier**, a doctoral student under the supervision of Dr. James Yang, has been selected to receive a travel award for the 13th Annual Regional [National Occupational Research Agenda](#) (NORA) Young/New Investigators Symposium to present her research.



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# Bakirci Speaks at TEDxTexasTechUniversity



**Çağrı Mert Bakırcı**, a doctoral student in the Department of Mechanical Engineering, was one of the speakers at [TEDxTexasTechUniversity 2015](#) in February 2015. His research is on evolutionary biology, with a focus on evolutionary robotics, a field that tries to apply the principles of evolutionary biology to robotics and artificial intelligence.





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# Fillingim Named Finalist for Hertz Foundation Fellowship



**Andrew Fillingim**, an undergraduate researcher in the [Biomedical Micro/Nano Device Lab](#), has been named one of 50 finalists for the 2015 class of Hertz Fellows. The Hertz Foundation funds graduate education for leaders in the fields of applied physical, biological and engineering sciences and encourages its awardees to pursue science for the public good.



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# Ivenso Receives Biophysical Society Student Research Achievement Award



**Ikenna Ivenso**, a doctoral student, was awarded the 2015 Student Research Achievement Award and a 2015 Education Committee Travel Award from the Biophysical Society. He presented his abstract at the Biophysical Society's 59th Annual Meeting, which was held in February 2015 in Baltimore, Maryland.



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# Haputhanthri Wins Best Poster Award at ASME ICES/Fuel Cell



**Shehan Haputhanthri, a doctoral student in the Department of Mechanical Engineering, won the Best Graduate Student Poster Award at the [ASME 8th International Conference on Energy Sustainability and 12th Fuel Cell Science, Engineering and Technology Conference](#) held in Boston, Massachusetts in July 2014.**

**His poster was titled "Ammonia as an Alternate Transport Fuel: Emulsifiers for Gasoline Ammonia Fuel Blends and Real Time Engine Performance."**



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# Vargas wins Outstanding Student Presenter Award



Evan Vargas, a doctoral Student in the Department of Mechanical Engineering, **won the Outstanding Student Presenter Award at the 2014 Spring Technical Meeting of the Central States Section of The Combustion Institute.** His presentation was titled "Effects of Particle Size on Microwave Heating of Aluminum Powder Compacts."

## Basu and Bilbao Named ARCS Scholars



**Avik Basu and Alejandro Bilbao, mechanical engineering doctoral students, have been selected as ARCS Scholars for the 2014-2015 year by the [Lubbock Chapter of the Achievement Rewards for College Students](#). They will be honored at an event on October 28. The Lubbock Chapter of ARCS was founded in 1972. To be eligible for an ARCS scholar award, a student must be a United States citizen; at least at the junior level and majoring in mathematics, engineering, science or medicine; and maintain a 3.5 or above grade-point average.**

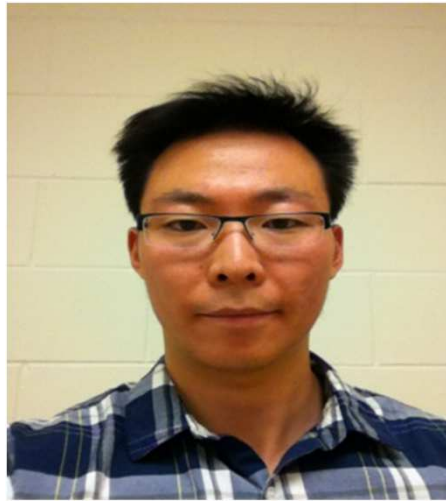


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## Liu Wins SIAM Student Travel Award



**Zhenyi Liu, a doctoral student in the Department of Mechanical Engineering, has been named a recipient of a Society for Industrial and Applied Mathematics (SIAM) Student Travel Award to attend the [SIAM Workshop on Network Science](#) (NS14) in July 2014 in Chicago, Illinois.**



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# Haputhanthri Wins First Place in Graduate Student Research Poster Competition



**Shehan Haputhanthri, a doctoral student, won first place in Engineering Category 2 at the [2014 Graduate Student Research Poster Competition](#), hosted by the Texas Tech Graduate School.**



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## Gragg Receives Second Place in Outstanding Dissertation Award Competition



**Dr. Jared Gragg, who recently completed his dissertation in the Department of Mechanical Engineering, received second place in the [Texas Tech Graduate School's Outstanding Dissertation Award Competition](#). His dissertation title was "Investigating the onset of slip in gait by employing probabilistic theory and optimization-based motion prediction." Gragg was nominated by Dr. James Yang, an associate professor of mechanical engineering.**





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# Pawan Maharjan has been awarded an AT&T Chancellor's Graduate Fellowship



Pawan Maharjan has been awarded an *AT&T Chancellor's Graduate Fellowship* to pursue a Master's degree in the Department of Mechanical Engineering, an honor given to outstanding prospective students of Texas Tech University.

# Faculty News



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# Pantoya Named YWCA Woman of Excellence



**Dr. Michelle Pantoya**, J. W. Wright Regents Chair in Mechanical Engineering and professor, has been named to the YWCA of Lubbock's [Women of Excellence](#) academy, a program which recognizes and honors women in our community who excel in their careers. She was nominated for the award by Al Sacco Jr., dean of the Whitacre College of Engineering.



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# Texas Tech Hosts FTC Regional Robotics Championship



Teams of 9th-12th graders from the western half of Texas participated in the FIRST® Tech Challenge (FTC) Panhandle-Plains Regional Championship Tournament on March 3 for an opportunity to win statewide recognition for design excellence, sportsmanship and teamwork and to advance to the National Championship in St. Louis. The event will be hosted by Dr. Alan Barhorst, a professor of mechanical engineering.



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# Hanson Named Chair Elect of ASME Board on Student Programs



**Dr. Jeff Hanson, Instructor of mechanical engineering, has been named chair elect of the American Society of Mechanical Engineers (ASME) Board on Student Programs.**

**The chair provides guidance and leadership to ASME student sections on the university and college campuses to enhance the quality, content and relevance of their activities in preparation for their professional career.**



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# Pantoya Featured on Discovery Channel Canada's Daily Planet



**Dr. Michelle Pantoya, J. W. Wright Regents Chair in Mechanical Engineering and professor of mechanical engineering, was recently featured on the Discovery Channel Canada's program, Daily Planet.**

**Pantoya, along with representatives from the Lubbock County Sheriff's Department, demonstrate how her research into nanoparticles has led to advances in combustion and explosions that could lead to safer ammunition, the elimination of biological threats, and many other applications.**



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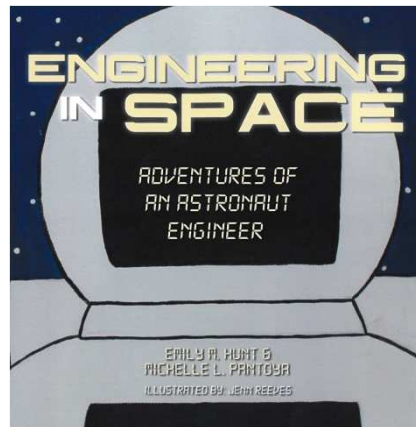
Department of Mechanical Engineering

# Gray`s Artwork Featured on Texas Country Reporter



**George Gray, an instructor of mechanical engineering, was recently featured on [Texas Country Reporter](#), a weekly syndicated television program that airs on broadcast television across Texas. His artwork is available for viewing on his website at [ironmongerartworks.com](http://ironmongerartworks.com) and the video interview is available through [Texas Country Reporter's YouTube channel](#).**

# Dr. Michelle Pantoya Published Fourth Children Book on Engineering



**Dr. Michelle Pantoya published her fourth children book, *Engineering in Space: adventure of an Astronaut Engineer* is an exciting look into space through the eyes of an engineer. From lift-off to touch-down, engineering principles are integrated with a first-hand account of the beauty of space. The fascinating story uses rhyming and rhythm to creatively engage the reader on a journey through space.**





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## New faculty - Dr. Craig Snoeyink



**Dr. Criag Snoyink joined the department in September, 2014. Dr. Snoeyink is developing nano-scale optical metrology techniques and applying them towards fundamental biological and fluid mechanics questions. Dr. Snoeyink received his PhD in Mechanical Engineering from the Purdue University in 2012. Prior to joining the TTU faculty Craig was a postdoctoral research fellow at TTU.**

## Departmental News



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## CB&I Advanced

# Manufacturing/Prototype Laboratory

ITEM DESCRIPTION	ESTIMATED COST
Haas VF-2, 30" X 20" X 20", 5-Axis, CNC Milling Machine	\$104,500
	\$59,998
Haas ST-10, 14" X 14", CNC Lathe	
EOS Metallic 3D Printer	\$600,000
Flow Mach 2b 1313b Waterjet	\$112,000
Faro Arm , Coordinate measuring system 3D laser scanner	\$74,019
Accu II Milling 10" X 54" Machine	\$13,000
Super Summit 24" X 60" Engine Lathe	\$50,789
Baileigh RDB-175 Tubing Bender w/ Round Pipe Die Package	\$10,503
Wilton/Jet 20" Geared Floor Drill Press	\$4,299
Wilton/Jet Table Top Drilling Mill	\$2,999
ECONOLINE Abrasive Blast Cabinet	\$5,900
Bench Depot Student Project Work Benches	\$10,398
Hand tool sets for student use w/ tool box	\$1,643
Wellsaw V20 Vertical Bandsaw	\$12,372
Accu II Milling 10" X 54" Machine	\$13,000
Accu II Milling 10" X 54" Machine	\$13,000
Summit 14" X 40" Engine Lathe	\$13,464
Summit 14" X 40" Engine Lathe	\$13,464



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# **Undergraduate Laboratory Development**

- **Proposals submitted to the college for renovation of three undergraduate labs and machine shop as follows:**
- **Advanced Nano/Biomaterials and Nano/Biomechanics Lab**
- **Advanced Energy, Exergy and Flow Lab**
- **Industrial and Networked Control Systems Lab**
- **Advanced Manufacturing/ Prototype Lab**



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# Undergraduate Laboratory Development

- **Phillips 66 Donation: Dynamometer for Engine Experiment**
- **New Impact Testing Machine**
- **Upgraded Tensile Testing Machine**
- **Upgraded Control lab**
- **New micromilling machine for M&M Lab**



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# Additional Space

**Construction Engineering**  
**Industrial Engineering**



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# General Comments

- **The Mechanical Engineering Department students (Undergraduate 1,524, graduate 146 ), faculty (35) and instructors (11) are increasing in number.**
- **The ME undergraduate program is well reputed as indicated by enrollment and competition among industry to recruit our students.**
- **Honors program in ME is working well.**
- **Mandatory exit exam in Design II is working well.**



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# General Comments

- **The department appreciates the Industry Projects for the Capstone Design class.**
- **Common syllabus and common exams at lower level courses are going well.**
- **Common syllabus and common course materials at upper level courses are going well.**
- **ABET visit in 2017**





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# Jharna on ME Pedagogy



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**Report of ASME MEDH (Mechanical  
Engineering Department Head) Sub-  
Committee on ME Pedagogy  
November, 2014  
Jharna Chaudhuri,  
Professor and Chair,  
Texas Tech University**



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# Incorporating New Science into Curriculum

## MIT – ME Program

- Required Course

Micro/Nano Engineering Laboratory



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# Incorporating New Science into Curriculum MIT

Elective Courses (2 required)



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# **Incorporating New Science into curriculum**

## **MIT - seven areas of excellence**

- **Area 1: Mechanics: Modeling, Experimentation, and Computation (MMEC)**
- **Applications span from the nano/micro world to the geophysical domain.**
- **Area 2: Design, Manufacturing, and Product Development**
- **Application to Design that Matters, Formula SAE, Satellite Engineering Team, Solar Electric Vehicle Team. Flagship products for new companies and are entered in the MIT \$100K Entrepreneurship Competition.**
- **Area 3: Controls, Instrumentation, and Robotics.**
- **Applications include health care, security, education, space and ocean exploration, autonomous systems in air, land, and underwater environments.**
- **Area 4: Energy Science and Engineering.**
- **Applications to high performance combustion engines, batteries and fuel cells, thermoelectricity and photovoltaics, wind turbines, and efficient buildings.**



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# **Incorporating New Science into curriculum**

## **MIT - seven areas of excellence**

- **Area 5: Ocean Science and Engineering**
- **Applications include navigation of underwater vehicles and smart sensors for ocean mapping and exploration; biomimetics studying marine animals; ultradeep ocean gas and oil extraction**
- **Area 6: Bioengineering**
- **Applications include understanding, diagnosing, and treating diseases, drug discovery and drug development; tissue-engineering.**
- **Area 7: Nano/Micro Science and Technology**
- **Applications include MEMS and NEMS, energy conversion at nano and microcales, 3D nanomaterials, etc.**

# MIT Physics – Active Learning Class Room





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# Primary Goal

- To establish a highly collaborative, hands-on, computer-rich, interactive learning environment
- To teach large classes
- To retain women and minorities





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# Approach or Teaching Style

- No face to face lecture (video lectures, on-line quizzes)
- 3 students at each table (lab tops)
- Work on problems, projects and discussion (Socratic-like dialogue)
- Instructor work with each team separately



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# Impacts

- More Responsibility on students
- Ability to solve problems is improved
- Conceptual understanding is increased
- Attitudes are improved
- Failure rates are drastically reduced, especially for women and minorities
- "At risk" students do better in later engineering statics classes



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**Report of ASME MEDH Sub-  
Committee on ME Pedagogy – March,  
2015 –Also TECAID Program  
Jharna Chaudhuri  
Professor and Chair**



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# **ASME- TECAID (Transforming Engineering Culture to Advance Inclusion and Diversity) Project**

- **Michigan Technological University**
- **University of Oklahoma**
- **Oregon State University**
- **Purdue University**
- **Texas Tech University**



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# Department of Mechanical Engineering Texas Tech University

## Enrollments\Representation in Mechanical Engineering for 2013-2014 School Year

	Number in Mechanical Engineering Department	Percent Underrepresented Racial/Ethnic Minority*	Percent Women
Undergraduates Enrolled	1336	28.79	12
Graduates Enrolled	149	27	9
Tenured/Tenure-track Faculty Employed	35	5.7	14.28



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# Increase Diversity

**Increase number of women students in the  
department of Mechanical Engineering at Texas  
Tech University**

# **Cumulative continuation rate and graduation rates of female students in the Department of Mechanical Engineering at Texas**

Female		Cumulative Graduation Rates and Continuation Rates							
Cohort Year (fall)	Total Head Count	Continu ed to 2nd Year	Continu ed to 3rd Year	Continu ed to 4th Year	Grad. withi n 4 years	Continued to 5th Year	Grad. withi n 5 years	Continue d to 6th Year	Grad. withi n 6 years
2002	71	46	38	33	13	20	25	7	29
2003	59	39	32	30	13	15	24	3	26
2004	46	34	26	23	9	14	17	3	20
2005	50	34	31	30	18	10	27	0	27
2006	71	48	41	35	18	17	33	2	34
2007	85	51	39	34	16	18	26	6	29
2008	87	65	48	48	21	22	28		
2009	100	67	54	46	1				
2010	79	58	48						
2011	110	78							
2012	128								



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# Increase Diversity

**Focus on increasing the retention rate of women within mechanical engineering department**





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# **Vision of a fully inclusive mechanical engineering program**

- **Faculty, staff and students who are represented in numbers that are consistent with their representation in the region that the university serves**
- **All students in the program have an equal chance for success**
- **Sustain a culture in the classroom, the lab, the field and in the hallways that is welcoming to diverse populations**



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# Departmental goals

- **A need to diversify engineering culture as indicated by improved representation of women and minorities as students, faculty and staff**
- **An effort to increase the utilization of inclusive pedagogies that will improve student learning**



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# Barriers

## Lack of preparation

- Moving successful students from Pre-Engineering- Foundational- ME Major –
- Mathematical Skills
- Nature of Mechanical Engineering



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# Plan

- Focusing on the at-risk female students in the pre- and Foundational Engineering pools
- Mentoring and introduction to female mechanical engineers who are currently in the field
- Education about implicit biases for all engineering students
- Tutoring
- curricular enhancements that address women's interests and styles of learning.
- Introducing to Undergraduate Research