

# Just in Time Math Project

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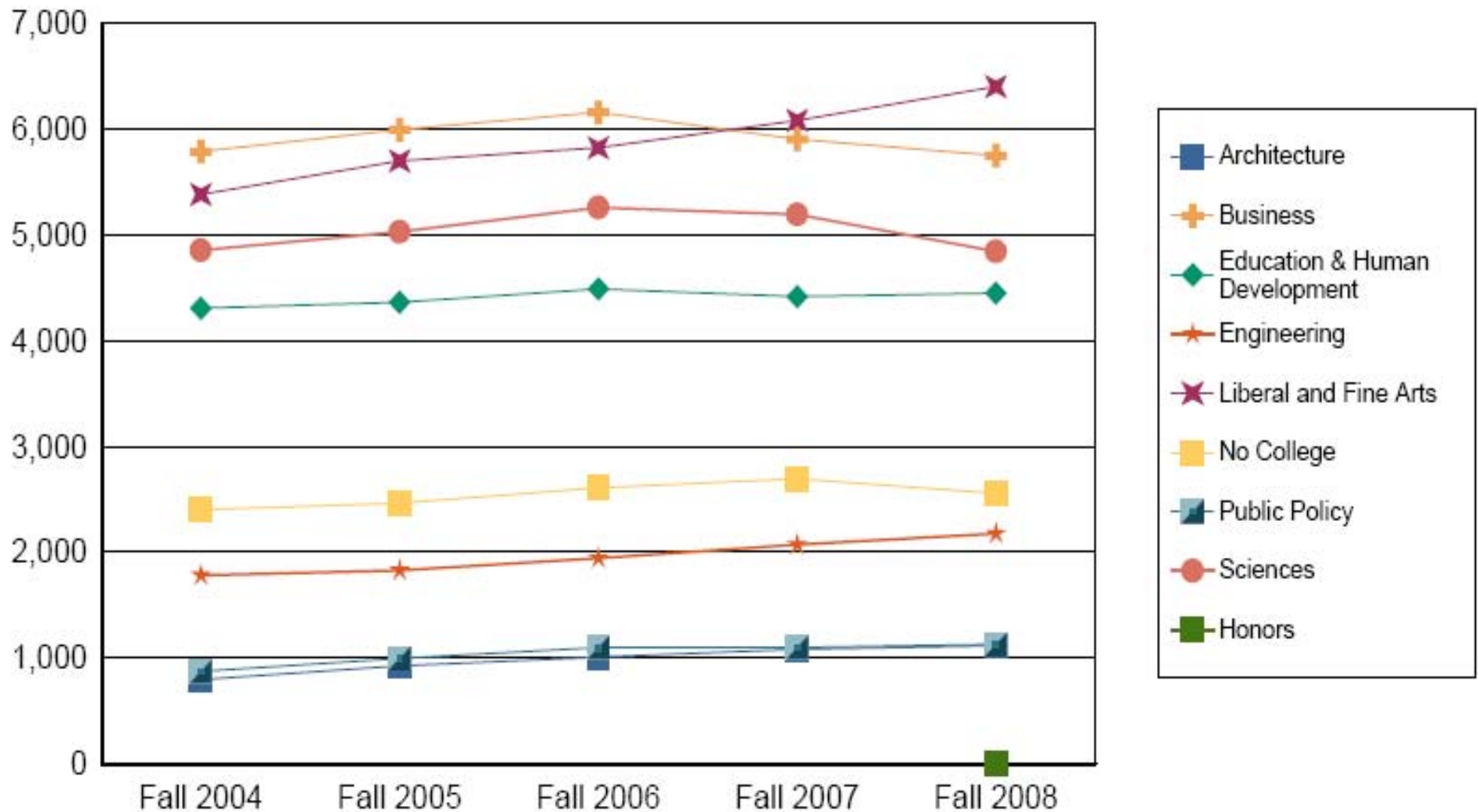
# About UTSA

- Established in 1969
- Fall 2008 Enrollment 28,413, 52% Female, 48% Male
- 64 bachelor's, 46 master's and 21 doctoral degree programs
- Three campuses: Main, Downtown and UTSA's Institute of Texan Cultures
- Eight Colleges: Architecture, Business, Education and Human Development, **Engineering**, Liberal and Fine Arts, Public Policy, Sciences, and Honors





# Enrollment at Different Colleges



# History of Engineering at UTSA

- Division of Engineering was established in Fall 1982
- BS degrees in CE, EE, ME
- Curriculum was built on existing applied science courses
- Approximately 400 students
- 5 CE faculty
- 2 EE faculty
- 1 ME faculty





# History of Engineering at UTSA (cont.)

- First BS Degree Awards-1984 (12 EE, 1 ME)
- First ABET Accreditation, 1987
- College of Engineering established in Fall 2000  
(Before 2000: College of Science and Engineering)
- Six MS degree programs have been established since 1989
  - MS in BME
  - MS in CE
  - MS in Comp E
  - MS in EE
  - MS in ME
  - MS in MFG



- Currently four departments: BME, CE, ECE, ME  
Center for Excellence in Engineering Education



# History of Engineering at UTSA (cont.)

- Ph.D. degree in **Electrical Engineering**, Fall 2002
- Ph.D. degree in **Biomedical Engineering (with UTHSCSA)**, Fall 2003
- Ph.D. degree in **Environmental Sciences and Civil Engineering**, Fall 2003
- Ph.D. degree in **Mechanical Engineering**, (2009?)





# Present Engineering at UTSA

- Four Departments: BME, CEE, ECE, ME
- 2148 students enrolled in Fall 2008
  - Graduate: 278 (incl. 75 Ph.D.)
  - Undergraduate: 1870
- Compared with 1020 students in Fall 2000
  - More than 110% increase
- Faculty
  - Tenured/Tenure Track: 61
  - Non Tenure Track: 16



# Retention/Graduation Rates

- 1-year retention ~ 65%
- 2-year retention ~ 50%
- 3-year retention ~ 45%
  
- 6-year graduation (Cohort 2001) 22.8%
- 6-year graduation (Cohort 2002) 33.0%
- Our goal for 6-year graduation (2016) 55%





# Strategies Implemented Since 2005

- Summer Immersion Camps for HS Students
- Participation in Research Laboratories
- Workshops for Teachers and Counselors
- Freshman Intervention
- Just-in-Time Math
- Early Exposure to the Engineering Profession
- Jump Start
- Visual Pedagogy
- Pre-Engineering
- Residential Learning Communities
- Etc.



# Just in Time Math (JITM)

## Math Placement

Math Level	F 2006	F 2007	F 2008
Developmental math (under prepared for any college level math)	18%	17%	15%
College Algebra	56%	39%	38%
Pre-Calculus	6%	19%	18%
Calculus I	11%	17%	17%
Calculus II	9%	8%	10%
Calculus III	NA	NA	2%





<b>Sem.</b>	<b>Traditional Curriculum</b>	<b>Proposed Curriculum</b>
1	<u>College Algebra</u> , Core	<u>Just in Time Math</u> , Core
2	<u>Pre-calculus</u> , Core	<b>Statics</b> , <i>Calculus for Engineers</i> , Physics I, Core
3	Calculus I, Core	Calculus II, <b>Circuits</b> , <b>Dynamics</b> , Physics II, Core
4	Calculus II, Physics I, Core	<b>Applied Engineering Analysis I</b> , Required Engineering Courses, Core
5	<b>Statics</b> , <b>Applied Engineering Analysis I</b> , Physics II, Core	<b>Engineering Analysis II</b> , Required Engineering Courses
6	<b>Dynamics</b> , <b>Circuits</b> , <b>Engineering Analysis II</b> , Core	Required Engineering Courses
7	Required Engineering Courses	Elective Engineering Courses
8	Required Engineering Courses	Elective Engineering Courses
9	Elective Engineering Courses	
10	Elective Engineering Courses	



# JITM Course Content

- Algebraic manipulation of engineering equations (linear and quadratic)
- Trigonometry
- Vectors and complex numbers
- Sinusoids and harmonic signals
- Systems of equations and matrices
- Differentiation, integration, differential equations





# JITM Course

## Text

- Gilat, Amos, MATLAB, An Introduction with Application, 3<sup>rd</sup> Ed., Wiley, 2008
- Course Notes for EGR 101 Introductory Mathematics for Engineering Applications, WSU (on WebCT)

## Class

- 3-50 Minutes Lectures per Week
- 1-50 Minutes Laboratory per Week

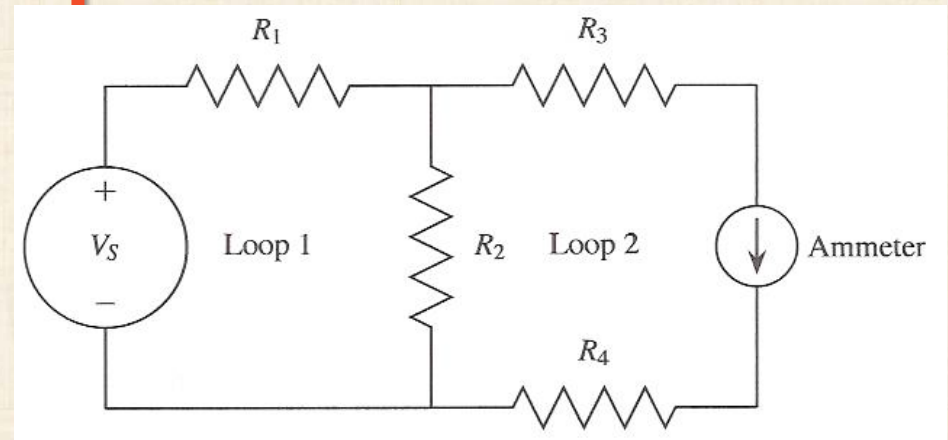
## Grading

- |   |     |     |
|---|-----|-----|
| • 2-Midterms                                  | 30% |     |
| • Lab Reports                                 |     | 20% |
| • Quizzes, Class Participation and Attendance | 10% |     |
| • Homework                                    | 10% |     |
| • Final Exam                                  | 25% |     |

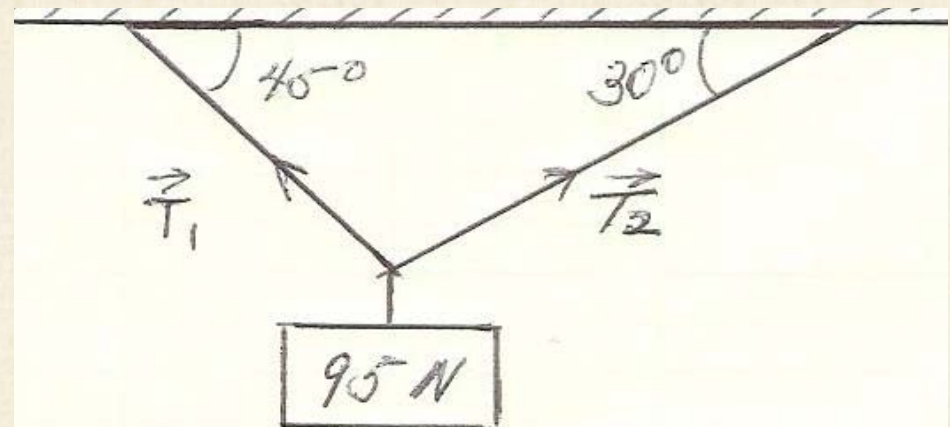


# Systems of Equations in Engineering - Example

- Two-loop electrical circuit.
- Static load support.
- Solve for currents and tension loads by
  - Substitution
  - Graphical method
  - Matrix algebra
  - Cramer's rule



Two-loop circuit



Static load



# Laboratory Assignments

1. Application of Algebra in Engineering
2. One-Link and Two-Link Robot Arms
3. Properties and Manipulations of Sinusoids
4. Two Loop Circuit Applications of Systems of Equations
5. Freefall Application of the Derivative
6. Spring Work Application of the Derivative
7. Leaking Bucket Application of a 1<sup>st</sup> ODE
8. Spring-Mass Application of a 2<sup>nd</sup> ODE



# Preliminary Assessment

- 20 students took the course in Summer of 2008
- 10 were registered as engineering students in Fall 2008
- Fall Average GPA = 3.20
- Fall SM&EGR Average GPA = 3.13
- All passed PHYS, MATH, EGR
- One “F” for CHEM and 2 “W”’s for CHEM and Freshman ME
- Overall, better performance than traditional group





# Summary

- Our efforts constitute a fusion of strategies which have as its core long-term objective the minimization of factors that adversely affect academic performance of first year engineering students.
- JITM and other curricular modifications seem to improve the first year retention rate among engineering students who are not calculus ready.
- Within couple of years we should be able to assess the second and third year retention rates and eventually four, five, and six year graduation rates.

