JUST IN TIME MATH PROJECT AT UTSA

M. Shadaram, Associate Dean of Engineering, P.I.
J. Colibri, Program Specialist, Presenter
Center for Excellence in Engineering Education
University of Texas at San Antonio
San Antonio, TX

Second Annual Meeting
National Engineering Mathematics Consortium

Louisville, KY
June 22, 2010

About UTSA

- Established in 1969
- Fall 2009 Enrollment 28,955, 49% Female, 51% Male
- 64 bachelor's, 49 master's and 21 doctoral degree programs
- Three campuses
- Eight Colleges: Architecture, Business, Education and Human Development, Engineering, Liberal and Fine Arts, Public Policy, Sciences, and Honors

Engineering at UTSA

- Four Departments: Biomedical; Civil & Environmental; Electrical & Computer; Mechanical. Tenured/Tenure Track Faculty: 70
- 2,336 students enrolled in Fall 2009 versus 1,020 students in Fall 2000
- Fall 2009:
  - Undergraduate: 1,952
  - Graduate: 359 (including 95 Ph.D.)



College of Engineering
Retention/Graduation Rates as of Fall 2009

- **1-year retention ~ 71%**
- **2-year retention ~ 48%**
- **3-year retention ~ 42%**
- **6-year graduation (Cohort 2001) 22.8%**
- **6-year graduation (Cohort 2002) 33.0%**
- **6-year graduation (Cohort 2003) 29.0%**
- **Our goal for 6-year graduation (2016) 55%**

(mandated by the State of Texas)

JITM COHORT RETENTION

- 50% of Fall 2008 Participants were still enrolled in Engineering as of Spring 2010.
- 100% of Fall 2009 Participants were still enrolled in Engineering in Spring 2010.
- ___% of Spring 2010 Participants were enrolled in Engineering for Fall 2010.

Math Placement Before and After JITM (beginning Fall 2008) at UTSA

Math Level	F 2006	F 2007	F 2008	F2009
Remedial Math (under prepared for any college level math)	18%	17%	15%	9% (but not accepted into COE)
College Algebra*	56%	39%	38%	48%
Pre-Calculus*	6%	19%	18%	35%
Calculus I**	11%	17%	17%	9%
Calculus II**	9%	8%	10%	NA
Calculus III**	NA	NA	2%	NA

*Pre-EGR admit status
**Admitted to COE

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, 3rd Ed., Wiley, 2008
- Course & Lab Notes for EGR 101, Introductory Mathematics for Engineering Applications, Wright State University (on WebCT)
- Req'd reading for Freshman Seminar – Farewell, My Subaru

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%
• Book Report on LC Req'd Reading	5%	
• Final Exam		25%

*Students earn 3 social & behavioral science credits--it's a Core Curriculum class

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 1st Ordinary Differential Equation
8. Spring-Mass Application of a 2nd ODE

Outreach/Marketing Efforts

- Presentations about JITM to Pre-Calculus classes
- Email blasts and hard copy mass mailings to to newly admitted Engineering students
- Phone and email outreach to high school math and science department heads
- Posting flyers on bulletin boards around campus

Student Survey Feedback

18 Fall 2009 JITM Cohort Students Agreed that JITM:

1. Increased their motivation to study engineering
2. Increased their chances of success in engineering
3. Increased their motivation to study math
4. Increased their chances of success in future math courses
5. Homework problems aided their understanding of lecture material

Student Survey Feedback cont.

8 Spring 2010 JITM Cohort Students Agreed that JITM:

1. Increased their motivation to study engineering
2. Increased their chances of success in engineering
3. Increased their motivation to study math
4. Increased their chances of success in future math courses
5. Homework problems aided their understanding of lecture material
6. Lab sections aided their understanding of lecture material also

Student Survey Feedback cont.

- Both cohorts strongly agreed that review/tutoring sessions with the peer group leader were valuable.
- Both cohorts agreed or strongly agreed that they were able to complete the requirements of both the Just in Time Math component and the Freshman Seminar component to their satisfaction.

Grant Funding

- Grant from Wright State University provides for 1 instructor and 1 TA for each academic year for JITM.
- UTSA has received 2 other grants from the UT System and the U.S. Dept of Education that provide funding for revamping EGR curriculum, which includes JITM and other new engineering curriculum developments.
- Grants from UT System and U.S. Dept of Education provide additional resources—mentors, program specialist, administrative costs, and stipends to students that help to cover the cost of tuition if a "C" or better is earned, etc. (Stipend amounts vary from semester to semester--$300, $1,000, and up to $2,000.)

Pros and Cons: Just in Time Math

- JITM is helping students to advance more quickly through Engineering curriculum.
- Only students who've passed Precalculus are eligible.
- JITM is housed in Learning Communities (Core Curriculum) and only freshman students w/30 credit hrs or less are allowed to register for it, which limits the pool of potential students.
- So far small sample sizes have made it difficult to make statistically significant generalizations about improved retention rates.
- UTSA COE Department Chairs want solid statistical evidence based on UTSA students' results that demonstrates success before JITM is accepted into COE curriculum.

  (Our goal is to have JITM integrated into the College of Engineering by Fall 2012.)

Summary

- As of Summer 2010, we now have just one academic advisor screen and register all JITM students. This should help to eliminate registration of improperly math-qualified students and increase retention of JITM students in our College of Engineering.
- JITM and other curricular modifications appear to improve the first year retention rates among engineering students who are not initially Calculus ready.
- Next year, we hope to have had larger enrollments in 2010 and 2011 from which to evaluate our success.
- Please contact Dr. Mehdi Shadaram if you have technical questions about our program: mehdi.shadaram@utsa.edu, 210-458-4431.