GNEG 1514
Engineering Applications of Mathematics

Kellie Schneider

Instructor

Freshman Engineering Program



UNIVERSITY OF ARKANSAS

Freshman Engineering Program

- implemented in 2007-2008
- mission
  - nurture the academic success, professional development, and individual growth of first-year engineering students by establishing the foundation for their excellence in the study and practice of engineering

Freshman Engineering Program

- two interconnected sub-programs
  - Academic Program
  - Student Services Program

FEP Academic Program

Fall Semester

GNEG 1111H
Honors Introduction to Engineering I

MATH 2554
Calculus I

CHEM 1103
University Chemistry I

PHYS 2054
University Physics I

ENGL 1013
Composition I

15 credit hours

Spring Semester

GNEG 1121H
Honors Introduction to Engineering II

MATH 2564
Calculus II

XXXX XXX4
University Chemistry II/University Physics II

XXXX XXX3
University Core Elective

ENGL 1023
Composition II

15 credit hours

FEP Academic Program

Fall Semester

GNEG 1111
Introduction to Engineering I

MATH 1284/GNEG 1514
Precalculus/Engineering Applications of Mathematics

CHEM 1103
University Chemistry I

XXXX XXX3
University Core Elective

ENGL 1013
Composition I

14 credit hours

Spring Semester

GNEG 1121
Introduction to Engineering II

MATH 2554
Calculus I

CHEM 1123/1121L
University Chemistry II

PHYS 2054
University Physics I

ENGL 1023
Composition II

16 credit hours

Math Placement Guidelines

Course	Course Name	MATH ACT	MATH SAT
MATH 2554	Calculus I	≥ 30	≥ 680
MATH 1284	Precalculus	≥ 26	≥ 690
MATH 1203	College Algebra	≥ 29	≥ 540
MATH 1204	College Algebra with Review	≥ 19	≥ 460
MATH 0003	Beginning and Intermediate Algebra	< 19	< 460

2010 FEP Cohort Math Placement

Course	Enrollment	% of Cohort
Calculus II or Higher	99	19.1%
Calculus I	179	34.6%
Pre-Cal/E-Math	160	30.9%
College Algebra	77	14.9%
Beginning Algebra	3	0.6%
No Math	8	1.5%

In 2010, 31% of new Freshman Engineers at the University of Arkansas begin their program of study one math class behind Calculus I.

Engineering Applications of Mathematics

Catalog Description

Overview of the mathematics topics heavily used in sophomore-level engineering courses. Topics include algebraic analysis, trigonometry, vectors and complex numbers, sinusoids and harmonic signals, systems of equations and matrices, differentiation, integrations, and differential equations. All topics are motivated by engineering applications. Usage of mathematical analysis software is emphasized.

E-Math vs PreCal

- E-Math is not a direct prerequisite to Calculus I.
  - Students must take and pass a series of three math placement tests offered by the math department.

- A grade of “C” or better in PreCal allows a student access to Calculus I.

E-Math Course Structure – Fall 2011

- homework assignments (20%)
  - high quality, hand-written assignments
- math skills exams (30%)
  - content from math placement tests
- exams (60%)
  - engineering content
  - 3, three-hour out of class exams

E-Math Fall 2010

- 51 students
- grade distribution

A	4
B	21
C	21
D	4
F	0
W	1

  - class GPA 2.50

Fall 2010

- 27 students completed E-Math with a “C” or better and enrolled in Calculus I in Spring 2011
  - 25 passed the math placement tests
  - 2 originally qualified for Calculus I
  - 18 (67%) earned a “C” or better in Calculus I
- 68 students completed PreCal with a “C” or better and enrolled in Calculus I in Spring 2011
  - 42 (62%) earned a “C” or better in Calculus I

Fall 2010 (cont.)

- 12 students completed E-Math with a “C” or better and took PreCal in the Spring
  - most students did not exhausted all attempts at the math placement test
  - 10 (83%) made a “C” or better

End of Class Survey

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
This course has increased my motivation to study engineering,	21%	38%	23%	13%	6%
This course has increased my chances of success in engineering.	29%	33%	23%	10%	4%
This course has increased my motivation to study math.	15%	31%	48%	4%	2%
This course has increased my chances of success in future math courses.	17%	52%	15%	13%	4%

Spring 2011 Enrollment

- E-Math Students
  - 2 (4%) – left the university
  - 2 (12%) – changed major
  - 43 (84%) – College of Engineering
- 2010 FEP Cohort
  - 25 (5%) – left the university
  - 58 (11%) – changed major
  - 435 (84%) – College of Engineering

E-Math Course Structure – Spring 2011

- daily homework (25%)
  - math skills problems
  - high quality, hand-written assignments
- daily quizzes (15%)
  - beginning and end of class quizzes
- exams (60%)
  - 4, two-hour out of class exams

E-Math Spring 2011

- 29 students
- grade distribution

A	0
B	5
C	10
D	6
F	7
W	3

  - class GPA 1.46

Spring 2011

- 4 students have passed all three math placement tests and qualify for Calculus I
- 12 students have passed two math placement tests
  - 9 have made at least one attempt on the third test
- 1 student has passed the first math placement test
- 11 students have not attempted any math placement tests

Fall 2010 Student Feedback

- “I took pre-cal becuase I didn't pass the math placement exam. I will say that E-math has helped me with my problem solving abilities.”

- “I enrolled in precal because I did not mak a passing score on the final math placement test during engineering applications of math and I was required to pass that in order to move Calculus.”

- “ I took Precalculus in the Spring of 2011, because I was unable to pass the Math Placement test that was required to place into Calculus I.”

Fall 2010 Student Feedback

- “I chose to take Precalculus in the spring after passing Engineering Applications of Mathematics in the Fall because I found that I was unprepared to pass the Competency exams for calculus. E-Math taught me a lot about solving engineering problems and following engineering homework instructions, but I couldn't relate many of the things I learned back to the Math Placement Exam. Since I continued to fail the exam, I decided to take Precalculus to fill out my knowledge. Now that I have completed both courses, the things that I learned in both are helping me pass calculus this summer.”

Fall 2010 Student Feedback

- “I took pre-calc because I failed to pass the placement test.”

- “I chose to not take the 3rd math test on the computer to get into Cal 1 because I felt I wasn't prepared enough to pass the class. I did not have any type of calculus in high school. Then taking E-Math I felt I still had not learned enough of the basics of calculus to skip pre-cal. During the year I watched one of my friends that did very well in E-Math struggle in Calculus more than my friends that took pre-cal.”