4th Annual National Engineering Mathematics Consortium

GNEG 1514
Engineering Applications of Mathematics

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

FEP Academic Program- Calculus Ready

Fall Semester

GNEG 1111
Introduction to Engineering I

MATH 2554
Calculus I

CHEM 1113
Chemistry for Engineers I

PHYS 2054
University Physics I

ENGL 1013
Composition I

15 credit hours

Spring Semester

GNEG 1121
Introduction to Engineering II

MATH 2564
Calculus II

CHEM 1133 & 1131L/PHYS 2074
Chemistry for Engineers II/
University Physics II

XXXX XXX3
University Core Elective

ENGL 1023
Composition II

15 credit hours

FEP Academic Program- PreCal Ready

Fall Semester

GNEG 1111
Introduction to Engineering I

MATH 1284/GNEG 1514
Precalculus/Engineering Applications of Mathematics

CHEM 1113
Chemistry for Engineers 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 1133 & 1131L
Chemistry for Engineers II

PHYS 2054
University Physics I

ENGL 1023
Composition II

16 credit hours

Math Placement Fall 2007- Spring 2010

	ACT/SAT MATH Scores		
Math Course	2007-2008	2008-2009	2009-2010
Calculus I	26/600	26/600	27/610
Precalculus	23/540	23/540	23/540
College Algebra	19/460	20/470	22/520
College Algebra with Review	N/A	N/A	19/460

Math Placement Fall 2010-Present

Math Course	ACT Score	SAT Score	Optional Math Placement Test Score
MATH 2554 Calculus I	≥30	≥680	PALG 80% & MALG 80% & PCALC 80%
MATH 1284 Precalculus GNEG 1514 E-Math	≥26	≥600	PALG 80% & MALG 80%
MATH 1203 College Algebra	≥23	≥540	PALG 80%
MATH 1204 College Algebra with Review	≥19	≥460	PALG 70%
MATH 0003 Beginning Algebra	<19	<460	

FEP Cohort and Math Placement

	2007	2008	2009	2010	2011
Calculus II and Higher	80	128	105	165	187
Calculus I	156	186	152	116	141
Precalculus	69	25	90	149	249
College Algebra	22	25	21	81	87
Beginning Algebra	6	12	17	7	10
Total Cohort Size	343	418	385	518	674

UNIVERSITY OF ARKANSAS

*Expected 2012 cohort ~800

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 Year One

- Fall 2010-Spring 2011
- GNEG 1513
- 3 hours lecture
  - 25-30 students per section
  - 2 sections Fall
  - 1 section Spring
- Optional Drill
- 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.

E-Math Course Structure – Fall 2010

- 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

Fall ‘10 E-Math Grade & Spring ‘11 Course

Spring 2011 Course	Fall 2010 E-Math Grade					
	A	B	C	D	W	Total
College Algebra	0	0	1	0	0	1
Precalculus	1	4	7	0	0	12
Calculus I	3	16	8	0	0	27
Other	0	0	2	1	0	3
None	0	1	1	0	0	2
Did not Return	0	0	2	3	1	6
Total	**4**	**21**	**21**	**4**	**1**	**51**

Calculus I Success- Spring 2011

Fall 2010 E-Math Students with C or better

- 27 of 46 attempted Calculus I
  - 25 completed Math Placement Tests
  - 2 had Precalculus credit
- 18 (67%) received a C or better in Calculus I

Fall 2010 Precalculus Students with C or better

- 68 attempted Calculus I
- 42 (62%) received a C or better in Calculus I

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

Spring ‘11 E-Math Grade & Fall ‘12 Course

Fall 2012	Spring 2011 E-Math Grade						
Course	**A**	**B**	**C**	**D**	**F**	**W**	Total
College Algebra	0	0	0	0	1	0	1
Precalculus	0	1	1	1	1	1	5
Calculus I	0	3	2	1	0	0	6
Calculus II	0	1	2	1	0	0	4
Calculus III	0	0	1	0	0	0	1
Other	0	0	1	0	0	1	2
None	0	0	2	1	3	0	6
Did not return	0	0	1	2	2	1	6
Total	**0**	**5**	**10**	**6**	**7**	**3**	**31**

E-Math Year 2

- Fall 2011- Spring 2012
- GNEG 1514
- 3 hour lecture (100 students)
- Mandatory 2 hours of drill (~30 students)
- Similar to MATH course structures

E-Math Year 2

- Math department believed in our instructors
- New Structure (3 lecture/2 drill) matched Precal
- More FEP students qualified for Precal/E-Math
- Enrollment increased campus wide

GNEG 1514 accepted as prerequisite for Calculus I

- Students with C or better may take Cal I
  - Same rule as Precalculus

E-Math Course Structure – Fall 2011 & Spring 2012

- Daily homework (30%)
  - Math skills problems
  - High quality, hand-written assignments
- Daily quizzes (5%)
  - Beginning quizzes in drill (Response Card)
- Exams (65%)
  - 4 in class exams
  - 1 exam during final exam period

Fall '11 E-Math Grade& Spring '12 Course

Spring 2012	E-Math Grade Fall 2011						
Course	A	B	C	D	F	W	Total
College Algebra	0	0	0	0	1	3	4
Precalculus	0	0	0	2	1	6	9
E-Math	0	0	0	1	5	1	7
Calculus I	21	21	18	2	1	1	64
Other	1	0	1	0	0	0	2
None	0	1	1	1	1	1	5
Did not Return	0	1	2	3	3	7	16
Total	22	23	22	9	12	19	107

Spring 2012 E-Math Grades

Grade	Count
A	5
B	17
C	16
D	6
F	4
W	39
Total	87

Fall 2012 Courses to be determined

Year 3 E-Math & College Algebra

- Fall 2012-Spring 2013
- Continue with GNEG 1514- same structure
  - 1 Lecture (100 students)
  - 3 Drills
- New accelerated program for highly motivated students starting for College Algebra (2 math courses behind Calculus)

Typical FEP- College Algebra Ready

Fall Semester

GNEG 1111
Introduction to Engineering I

MATH 1203
College Algebra

XXXX XXX3
University Core Elective

XXXX XXX3
University Core Elective

XXXX XXX3
University Core Elective

ENGL 1013
Composition I

16 credit hours

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Introduction to Engineering II

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Precalculus/Engineering Applications of Mathematics

CHEM 1113
Chemistry for Engineers I

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University Core Elective

ENGL 1023
Composition II

14 credit hours

Reasons for Accelerated Program

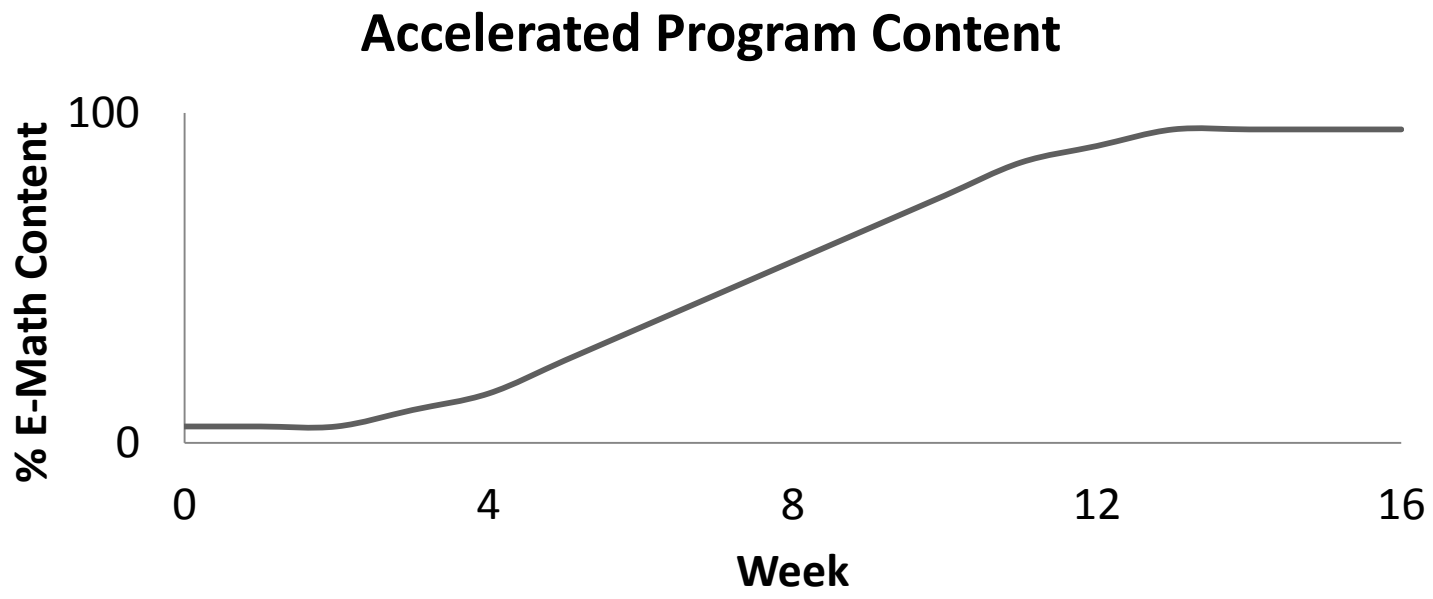
- Freshman Course load issues
  - No chemistry until 2nd semester
  - No physics until 3rd semester
  - Core electives do not prepare for engineering rigor
- Sophomore Course issues
  - Introduction to Engineering courses complete
  - Requisites for courses in chosen field not met
  - 4 of 6 core electives exhausted

Accelerated Program Structure

- MATH 1203c – College Algebra
  - 2 hours of lecture
  - Mandatory computer drill time
- GNEG 1514 – E-Math
  - 3 hours of Lecture
  - 2 hours of mandatory drill
    - immediately follows college algebra course time
- Offered to 36 students

Accelerated Program Structure

- Early focus primarily on college algebra topics
- Balanced near the middle
- End focus primarily on E-math topics



Accelerated Program Grading

- Separate grades for College Algebra and E-math courses
- E-math grade ≤ College Algebra grade
- Students may drop E-math without losing all 7 credit hours

Accelerated FEP - College Algebra

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15 credit hours

Tracking Progress

- Retention in College of Engineering
- Progression through Calculus Sequence
- Graduation Rates

- GNEG 1514 vs. MATH 1284 students
- Accelerated program vs. College Algebra

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GNEG 1514
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Dr. Heath Schluterman, FEP Instructor
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