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University of Toledo
Engineering Applications of Math

Scott C. Molitor, Ph.D.
Associate Professor of Bioengineering
Bioengineering Undergraduate Program Director

Brian W. Randolph, Ph.D., P.E.
Professor of Civil Engineering
Associate Dean for Undergraduate Studies, College of Engineering

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Undergraduate Engineering at UT

- ABET accredited Engineering Science programs
  - BioE, ChE, CivE, CSE, EE, ME
  - Target population for WSU Engineering Mathematics
- ABET accredited Engineering Technology programs
  - Construction, Computer, Electrical, Information Technology and Mechanical
- Mandatory co-op program for all Engineering Science students
  - Three semesters of co-op are required
  - Requires students to stay on schedule in their curriculum

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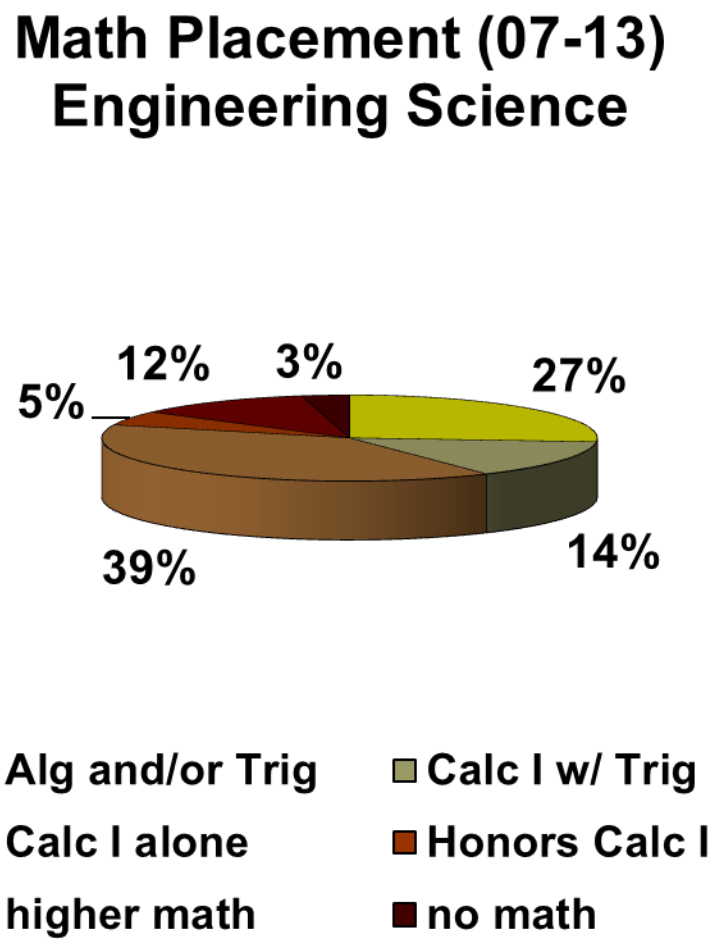
Undergraduate Engineering at UT

- Credentials, retention and subsequent data pooled across 2007 - 2013 entering classes
  - Offered EN math course over this same time frame
- Engineering Science credentials
  - ACT composite 25.9 / math 27.2
  - HS GPA 3.66
- First to second year retention (2007 – 2012 only)
  - 78% remain in EN and 86% remain at UT
- Six year graduation rate (2007 – 2008 only)
  - 54% graduate from EN and 65% graduate from UT

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Mathematics Placement

- Placement in math courses based on various factors
  - ACT or SAT Math score
  - Algebra placement test
  - Trigonometry placement test
- Goal is to have students take Physics I as soon as possible
  - Required for subsequent Engineering coursework
  - Many students go out on their first co-op after 3rd semester
  - 70% of first year students are on target or better



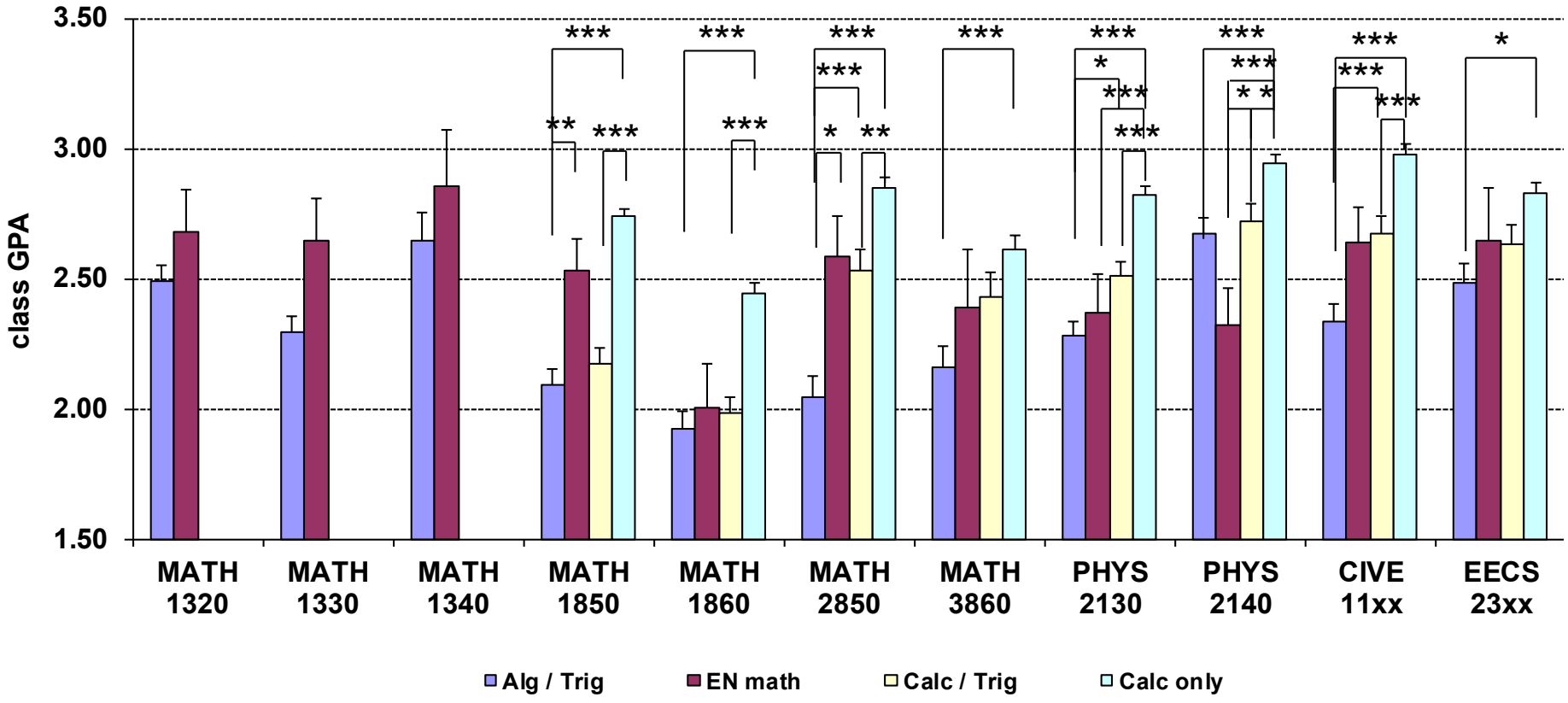
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UT Engineering Applications Course

- Optional supplement for students that place into College Algebra and Trigonometry courses
  - Goal is to improve student performance when they take Calculus I
- Adapted Wright State Mathematics for Engineering Applications Course materials
  - Topics range from vectors to differential equations
  - Present applications for each topic then introduce theory
  - Combined hands-on laboratory & recitation reinforces lecture topics
- Provide tangible benefits to encourage students to enroll
  - Physics department allows students that complete this course to enroll in Physics I and Calculus I simultaneously
- Passing rate is 89%, rate for C or better is 80%

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GPA in core courses



* p < 0.05, ** p < 0.01, *** p < 0.001

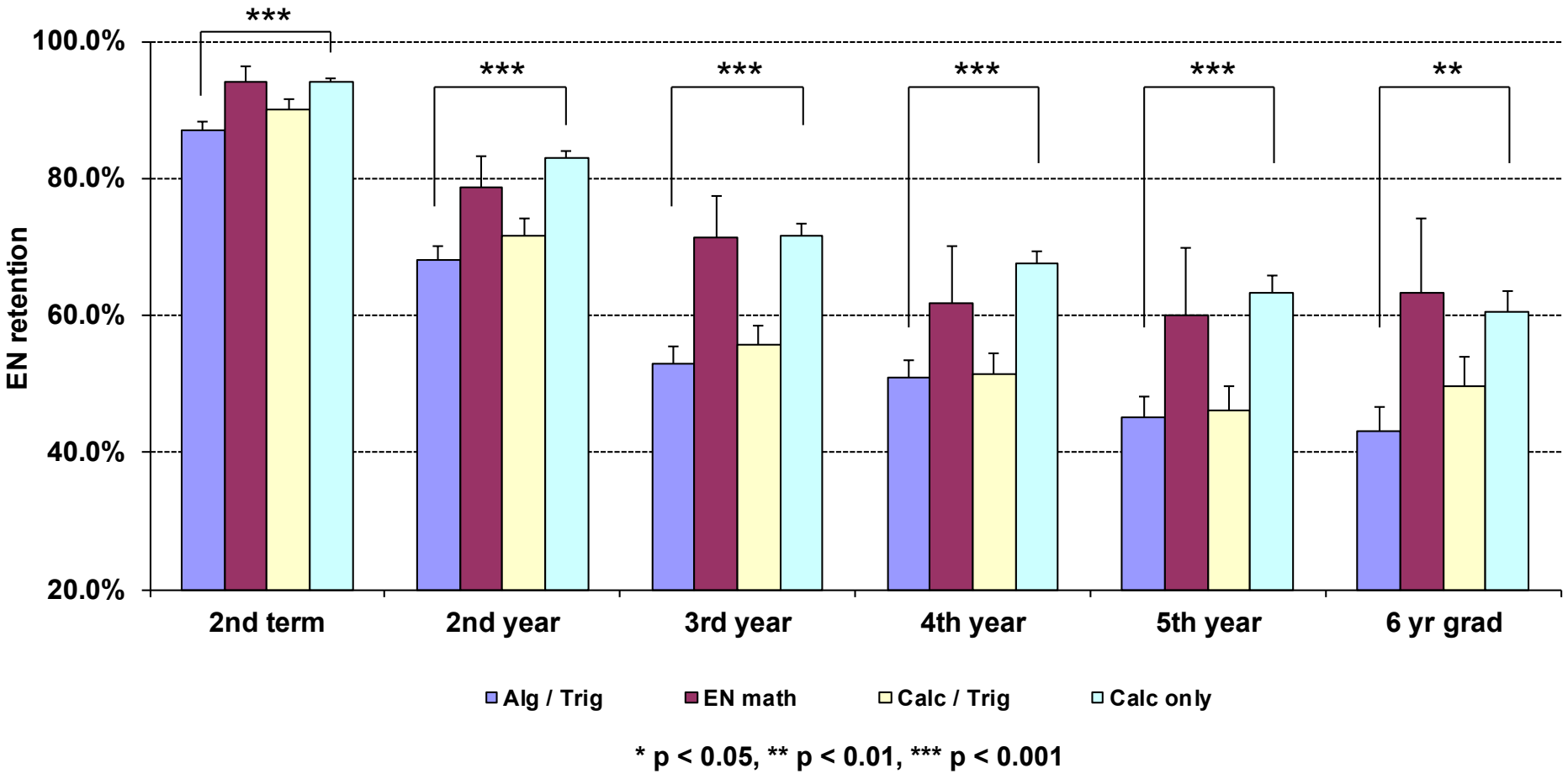
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GPA in core courses

- Mixed results with a few consistent trends
- EN Math cohort does just as well in MATH 1850 Calculus I as cohort that directly enters MATH 1850
- EN Math cohort out performs Alg / Trig and Calc / Trig cohorts in MATH 1850
- EN Math typically does not perform as well as Calc cohort in remaining MATH, PHYS & EN courses
- EN Math about the same as Calc / Trig and better than Alg / Trig in MATH, PHYS & EN courses

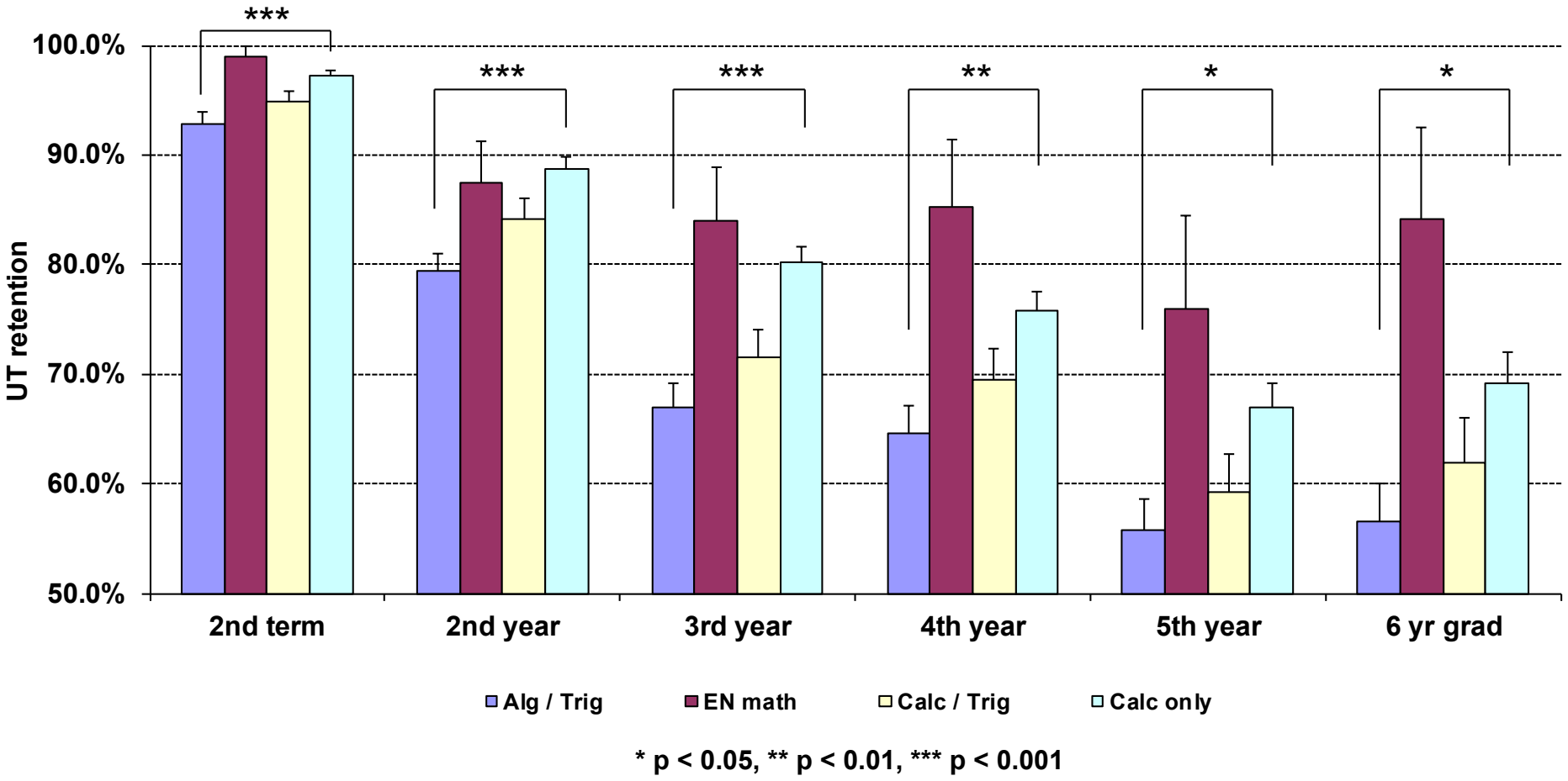
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Retention and persistence



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Retention and persistence



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Retention and persistence

- Clear and encouraging results
- EN math retention and persistence in EN and at UT comparable to cohort directly entering Calculus
- EN loses 15-20% more students from Alg / Trig and Calc / Trig cohorts compared to EN math
- UT loses 20-25% more students from Alg / Trig and Calc / Trig cohorts compared to EN math
- May explain core course GPA results
  - More EN math students stay and take core courses
  - Lower performing Alg / Trig and Calc / Trig are leaving

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Recent past and present

- Established permanent course number & offering
  - Former special topics CIVE 2990 is now GNEN 1800
  - Approval received full support of MATH department
- Lecture, homework and exams still based directly on Wright State EGR 101 course materials
  - Adopted EN Applications of Math textbook
- Modified laboratory sessions to improve course completion rate
  - Removed MATLAB and some hands-on lab exercises
  - Added problem solving recitations for HW and exams

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Plans for the future

- Expand population to capture full Alg / Trig cohort
  - BioE and CivE place all Alg / Trig students in GNEN 1800
  - CSE, EE and ME place a few, ChE does not place any
- Enroll Calc / Trig cohort in GNEN 1800 instead of Trigonometry supplement
  - MATH department is amenable to working with EN
  - Making effort to expand application-based problems
- Continue efforts to increase completion rate
- Expand offering to high schools and community colleges in NW Ohio / SE Michigan